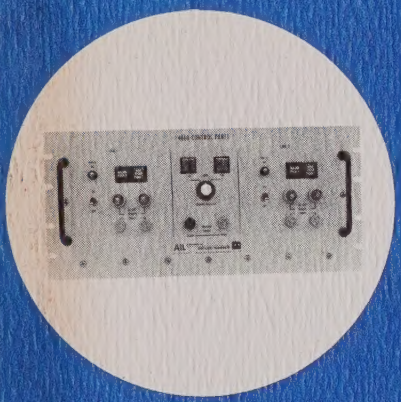
INSTRUCTION
MANUAL
FOR.....



REDUNDANT CONTROL PANEL
P/N 556335-X

T011-H-3

0480

EATON Advanced Electronics

Eaton Corporation
AIL Division
Deer Park, N.Y. 11729

NOTICE

This equipment was manufactured by

Eaton Corporation AIL Division

Applied Electronics Division

Satellite Communications Equipment

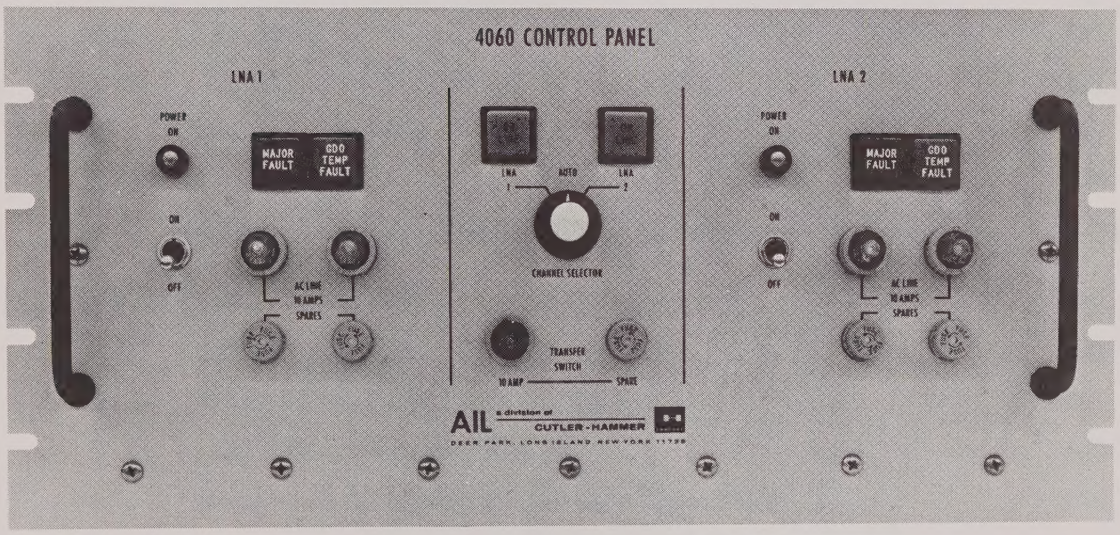
If further information concerning this equipment is desired contact:

Manager, Satellite Communications Equipment
Melville, Long Island, New York 11747
Telephone 516 595-4821
TWX 510 227-6073
FAX 516 595-4368

In any communication, please refer to the equipment part number, appropriate dash number, and serial number.

After the equipment is installed at a permanent site it would be advisable to notify AIL (preferably by letter or telephone) of the address. Then AIL newsletters of improvements, system changes, new add-on components, etc., could be mailed directly to the site.

REDUNDANT CONTROL PANEL
P/N 556335-X



EATON Advanced Electronics

Eaton Corporation
AIL Division
Deer Park, New York 11729

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SECTION I
INTRODUCTION

1.1 PURPOSE OF EQUIPMENT

The Redundant Control Panel (Figure 1-1), P/N 556335-X, provides power for two Low-Noise Amplifiers (LNA's) connected in a redundant configuration. It indicates, by means of panel lamps, when certain malfunctions (faults) occur in each LNA and, when in the AUTO mode, provides automatic switching from the on-line LNA to the standby LNA when a MAJOR FAULT occurs in the on-line LNA. Connections for a remote monitor are provided to allow a remote display of LNA fault indicators and LNA on-line information.

1.2 DESCRIPTION

The Control Panel (CP) operates from a 120 Vac (99 to 133 V, 47 to 63 Hz) or 240 Vac (198 to 264 V, 47 to 63 Hz) power source. When used with LNA's with only one paramp stage, the second stage GDO fault logic card is not required. A1A2 and/or A2A2 and its contacts are strapped out. This is the only difference between the -1/-2 control panel and -3/-4 control panel.

	120 Vac	240 Vac
Two Paramp Stages	-1	-2
One Paramp Stage	-3	-4

The CP's (120 V and 240 V) are identical except for the ac connections to the transformers of eight internal power supplies. Because the ac voltage is supplied directly to the LNA's, however, the CP input voltage must correspond with that required by the LNA's.

The CP essentially contains two independent identical sets of power supplies, one for each LNA, plus relays that are operated from internal logic circuits and panel switch settings to drive the waveguide-coaxial transfer switch connected to the signal inputs (waveguide) and signal outputs (coaxial) of the two LNA's, thus switching, either by operator's choice or automatically, the on-line and standby LNA's. An additional feature of the relay circuits permits selection of either LNA for on-line operation by an operator at a remote site when the CP is set for AUTO mode of operation.

80-1018

Figure 1-1. Redundant Control Panel

Each channel of the CP contains four solid-state fully-regulated power supplies that provide typically: +11.0 V (PS3/PS7), +18.0 V (PS1/PS5), -18.0 V (PS2/PS6), and +24.5 V (PS4/PS8) dc to the LNA. Two fans (one for each channel) provide forced air circulation to prevent heat buildup. The CP also contains a logic assembly that receives inputs from the two LNA's and operates to display, LNA fault indications if applicable, on the front panel.

The front panel of the CP contains the power switch, a POWER-ON green LED indicator, a MAJOR FAULT (red) and a GDO TEMP FAULT (amber) indicator lamp, two ac line fuses in indicator fuseholders, and two spare fuses for each LNA. The panel also contains a CHANNEL SELECTOR switch (LNA 1, LNA 2, AUTO), two green ON LINE panel lamps, a fuse in an indicator holder, and a spare fuse for the waveguide-coaxial transfer switch power line.

The rear panel of the CP contains six electrical connectors: J1/J4 for ac power to each channel, J2/J5 for connection to LNA 1, LNA 2, J3 for connection to a remote indicator unit, and J6 for connection to the waveguide-coaxial transfer switch. The two fans for forced-air cooling are also mounted on the rear panel.

The CP chassis is intended for standard 19-inch rack mounting.

Two 8-foot, 3-wire power cables, P/N 359442-1, are supplied with the CP. Two LNA power and control cables, P/N 556342-X, are available on order. These cables connect the CP to the LNA's, and can be provided in the specific length required for the installation. The "-X" on the part number indicates the cable length in feet (200 feet maximum, 61 metres maximum). Also, a transfer switch power and control cable, P/N 556343-X, can be provided in the correct length for the installation.

1.3 TECHNICAL DATA

Table 1-1 summarizes the input and output power capabilities of the CP. There are four versions of the CP: P/N 556335-1 and -3 are wired for 120 Vac nominal input. P/N 556335-2 and -4 are wired for 240 Vac nominal input.

Table 1-2 lists items supplied in an optional consumable spare parts kit for the Redundant Control Panel. This kit, P/N 556393-1, is applicable to all versions of the Redundant Control Panel.

Table 1-1. Power Summary for Redundant Control Panel

Ac Input Power Requirements; 47 to 63 Hz, Single Phase

CP Part Number	556335-1, -3	556335-2, -4
Input voltage, V	99 to 133	198 to 264
Fully loaded current, A	12 (6 per LNA)	6 (3 per LNA)
Fuse, A	10 per LNA	10 per LNA

Dc Output Power Requirements for LNA

CP Power Supply	PS1/PS5	PS2/PS6	PS3/PS7	PS4/PS8
Voltage *, V	+17 to +21	-17 to -12	+10.5 to +15	+24 to +28
Current **, A	0.4	0.4	3.5	10

*Voltage should be adjusted with the LNA connected and in operation so that the voltage at LNA J2 pins are monitored on the Parameter Test Set or measured with a digital voltmeter at the appropriate LNA J2 pins.

**Current listed is maximum

Dc Output Power Requirements for Waveguide-Coaxial Transfer Switch

CP Power Supply	PS4/PS8
Voltage, V	+24 to +28
Current, A	5
Fuse, A	10

Table 1-2. Consumable Spare Parts Kit for Redundant Control Panel

Kit P/N 556393-1 (Rev C)

Item No.	Description	Part No.	Mfr	Circuit Symbol		Qty Supplied
				Single Channel	Redundant	
1	Blower, Fan	125XR-182	Etri	B1	B1, B2	1
2	Lamp, 28 Vdc	387		DS2, DS3	DS2, DS3, DS5, DS8	5
3	Light Emitting Diode 28 Vdc, Green	507-4861-3735-500	Dialco	DS1	DS1, DS4	2
4	Fuse, 10 A, 250 Vac	314010	Little Fuse	F1, F2	F1, F2, F3, F4, F5	5
5	Relay	KRP11D-12VDC	Potter & Brumfield	K1	K1, K2	1
6	Toggle Switch	7690K8	Cutler-Hammer	S1	S1, S2	1

SECTION II

INSTALLATION AND OPERATION

2.1 GENERAL

The CP shall be installed so that the cable run to the LNA is not more than 200 feet (61 metres). Use LNA power and control cable P/N 556342-X, or equivalent. Two primary power cables supplied with the CP are 8 feet long. The transfer switch power and control cable, P/N 556343-X, or equivalent, shall be approximately the same length as the LNA power and control cable. Note that -X is the cable length in feet.

2.2 INSTALLATION

When the CP is received, open the shipping container and remove the packing material. Install the CP in a standard 19-inch rack. Refer to Figure 2-1 for dimensions, miscellaneous notes, and connector information. Make certain that the POWER switches are set to OFF.

Connect the LNA power and control cables to the CP but not to the LNA's. Connect the power cables to the CP and power source (Figure 2-2). Note that the plug is for U.S. standard 120 Vac service; for other power sources remove the plug and replace it with one appropriate for the source.

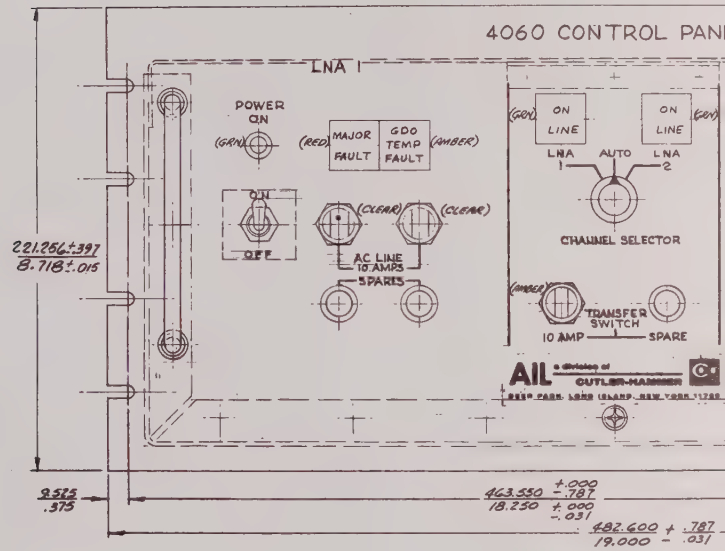
Set the POWER switches to ON. With a digital voltmeter, measure the voltages at the following pins of the LNA power and control cables (Figure 2-3). (Refer to LNA Manual T011-H-1 for pin locations.)

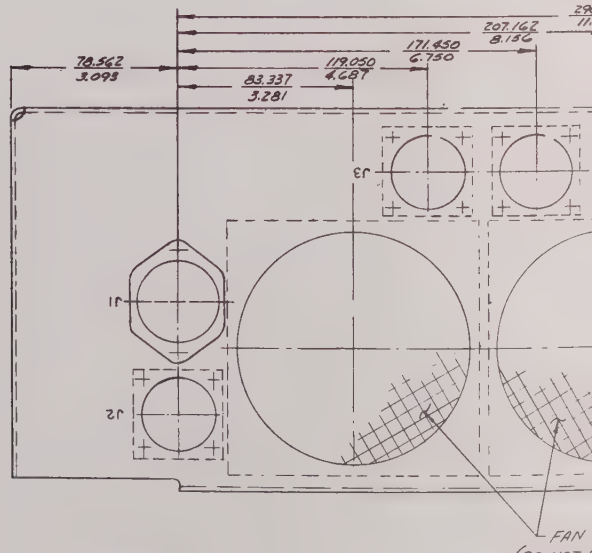
Pin to Pin		Volts, Dc	Power Supply
N	M	+17 to +21	PS1/PS5
F	M	-17 to -21	PS2/PS6
Z	W	+10.5 to +15	PS3/PS7
X	V	+24 to +28	PS4/PS8
		Volts, Ac	
K	J	99 to 133	-1/-3 CP
K	J	198 to 264	-2/-4 CP

NOTES:

1. SUGGEST MOUNTING IN 19 INCH (482.600 MM) PANEL WIDTH ENCLOSURE DEPTH 25 INCH (635.001 MM) MINIMUM, INCLUDING CABLE DRESS ON CHASSIS GUIDES, WITH FORCED AIR DUCTING.
2. ALL PLACARD INDICATOR LENS PULL OUT FOR EASY REPLACEMENT OF LAMPS. ALL LAMPS ARE P/N 387, LENS COLOR ARE INDICATED BY PAREN
3. L.E.D. P/N IS 507-4BG1-3735-500, 28VDC, DIALCO, IS HELD IN BY A KA NUT, UNSCREW AND PULL L.E.D. CARTRIDGE STRAIGHT OUT. THE PINS POLARIZED (OFF-SET) ON CARTRIDGE, TO REPLACE ENGAGE PINS PROP
4. FUSES ARE P/N 314 010 LITTLEFUSE (10 AMP 250 VAC) COLOR OF INDICATING FUSEHO ARE IN PARENTHESIS.
5. FOR LNA'S REQUIRING 2 PARAMP STAGES, P/N SERIES
6. FOR LNA'S REQUIRING 1 PARAMP STAGE, P/N SERIES 5
7. WEIGHT: 82 POUNDS (37.2 KILOGRAMS)

VIEW A-A
FROM SHT 2

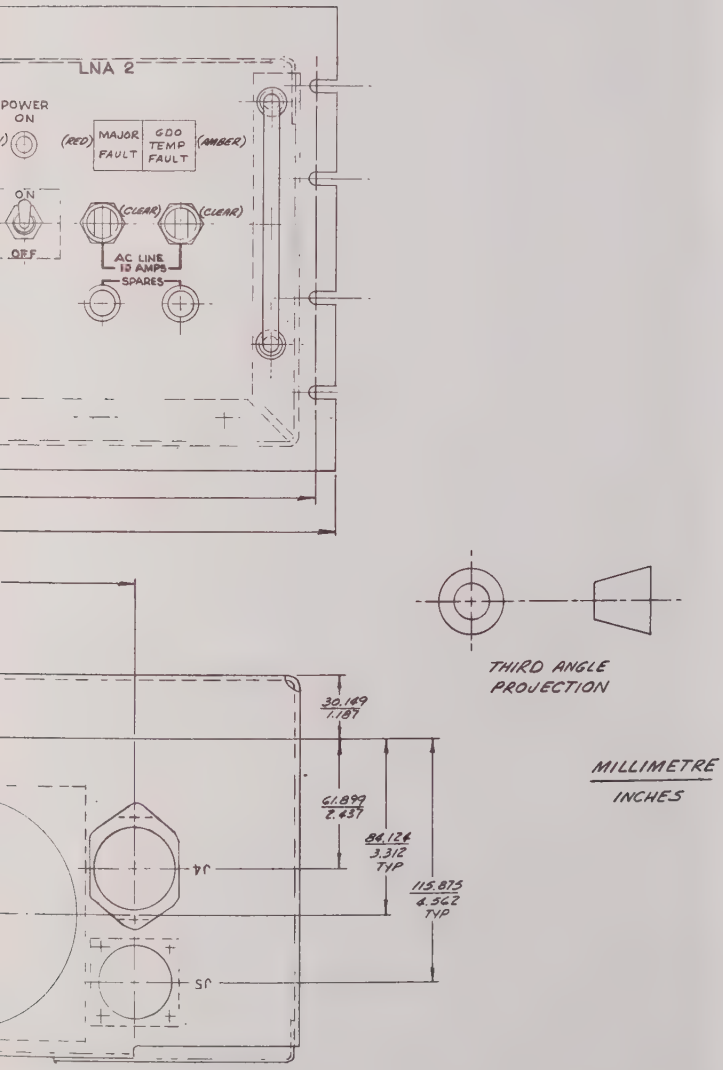




556335 REV D

VIEW B-B
(FROM SHEET 2)

CONNECTOR TABLE				
AIL PART NO.	CONNECTOR	PART NO.	FUNCTION	MATES WITH
556335-1	J1 (120 VAC)	HUBBELL 4586	TO AC POWER FOR LNA 1	4579C CONN OR EQUIV AND/OR CABLE AIL P/N 359442-1 (SUPPLIED)
556335-2	J1 (240 VAC)			
556335-1 556335-2	J2	BENDIX SP02A-20-26S	TO LNA 1	PTO6A-20-26P(SR) OR EQUIV AND/OR CABLE AIL P/N 556342-( )
556335-1 556335-2	J3	BENDIX SP02A-20-24S	TO STATION MONITORING EQUIP OR SECONDARY CONTROL PANEL	PTO6A-20-24P(SR) OR EQUIV
556335-1	J4 (120 VAC)	HUBBELL 4586	TO AC POWER FOR LNA 2	4579C CONN OR EQUIV AND/OR CABLE AIL P/N 359442-1
556335-2	J4 (240 VAC)			
556335-1 556335-2	J5	BENDIX SP02A-20-26S	TO LNA 2	PTO6A-20-26P(SR) OR EQUIV AND/OR CABLE AIL P/N 556342-( )
556335-1 556335-2	J6	BENDIX SP02A-20-16S	TO WAVEGUIDE/COAX TRANSFER SWITCH	PTO6A-20-16P(SR) OR EQUIV AND/OR CABLE AIL P/N 556343-( )



QTY REQD	PART OR IDENT NO.	CODE IDENT NO.	NOM OR DESCR	SPEC/MATL	SYM/NOTES	AIL PART NO.	FIND NO.
PARTS LIST							
			CONTROL PANEL	240 VAC	6	556335-4	—
			CONTROL PANEL	120 VAC	6	556335-3	—
			CONTROL PANEL	240 VAC	6	556335-2	—
			CONTROL PANEL	120 VAC	6	556335-1	—

Figure 2-1. Control Panel Installation Drawing 556335 (Rev D) (Sheet 1 of 2)

556335, REV C

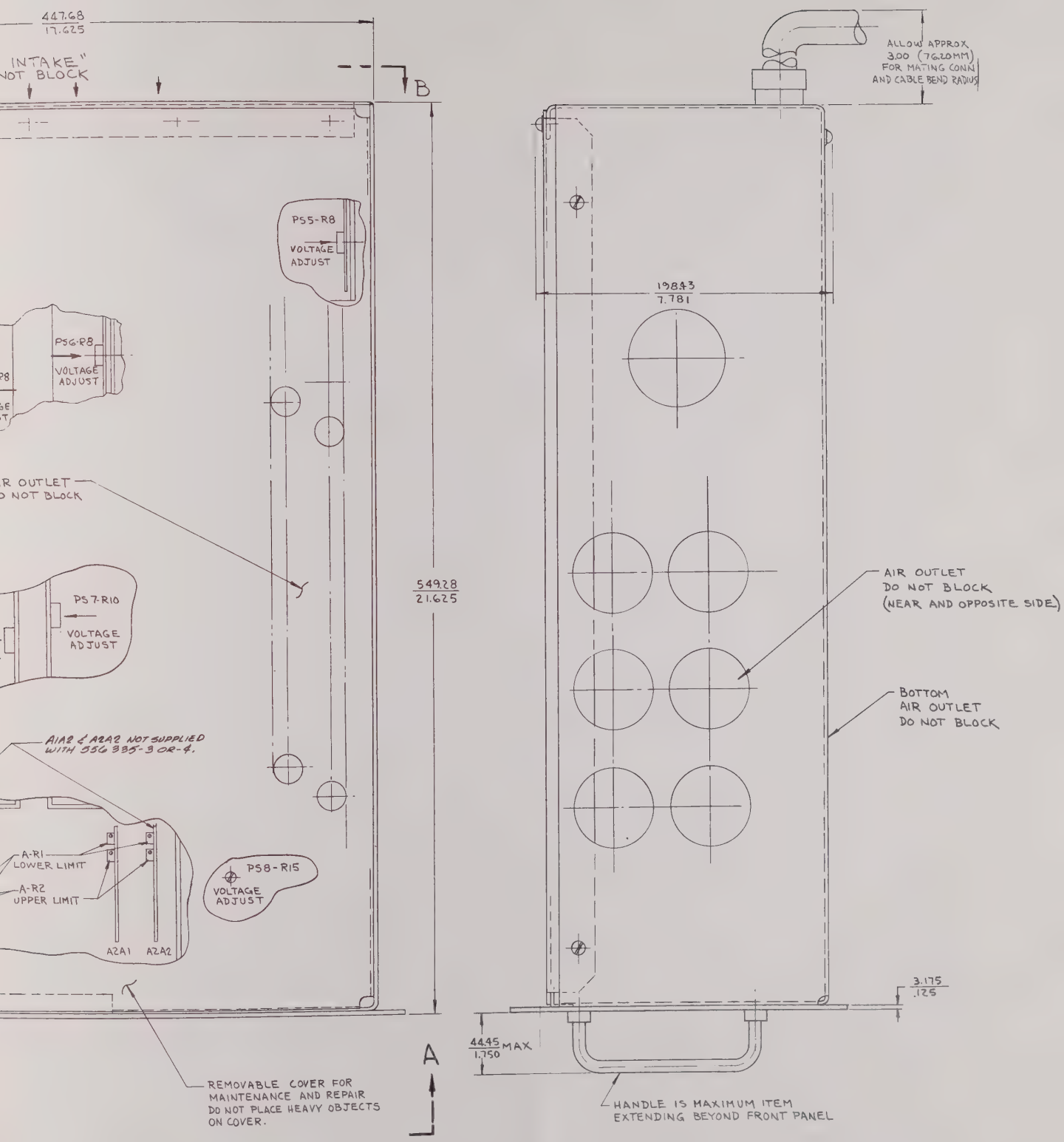
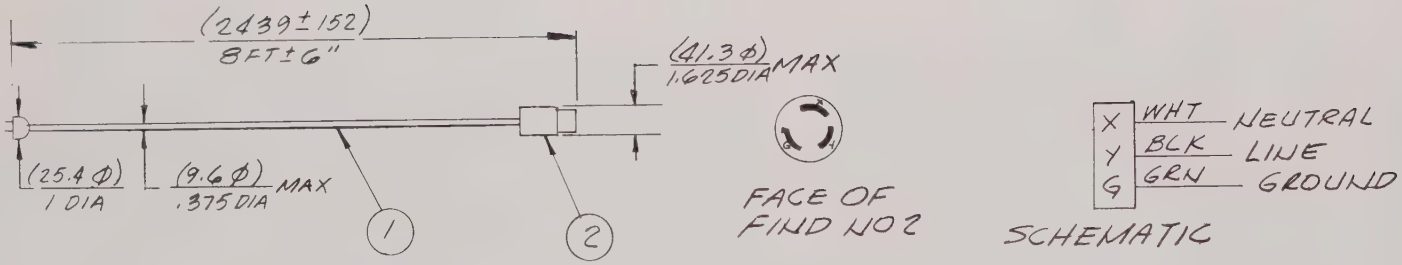


Figure 2-1. Control Panel Installation Drawing 556335 (Rev D) (Sheet 2 of 2)



-5	-4	-3	-2	-1	PART OR IDENT NO.	CODE IDENT NO.	NOM OR DESCR	SPEC/MATL	SYM/NOTES	AIL PART NO.	FIND NO.
				1	4579C		CONNECTOR	HUBBELL			2
				1	174085		LINE CORD	BELDEN			1
				X			CABLE ASSY			359442-1	—

QTY REQD — PARTS LIST

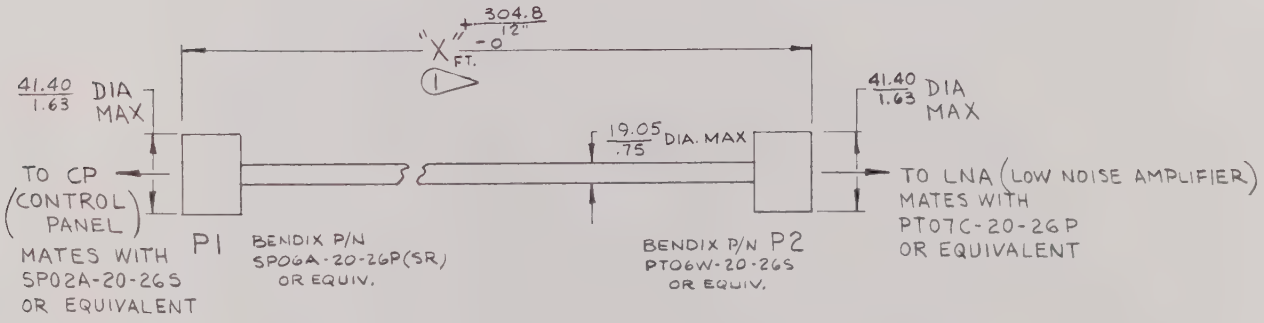
(MILLIMETRES)
INCHES

NOTES
1. DIMENSIONS IN INCHES, MM≃.
1 INCH = 25.40 MM,
1 FOOT = 304.8 MM

359442 REV C

Figure 2-2. Power Cable Assembly 359442-1 (Rev C)

TABLE I			
WIRE TERMINATION LIST			
FROM P1		TO P2	
PIN-A	+15 VDC	PIN-A	
3	GDO FAULT	B	
C	T.E. FAULT	C	
D	GDO 2 CURRENT SAMPLE	D	
E	GDO 2 VOLTAGE	E	
F	PS 2	F	
H*	AC PAIR SHIELD	H*	*SHIELD CONNECTED AT P1-H ONLY.
J	AC LINE	J	
K	AC NEUTRAL	K	
N	PS 1	N	
R	GDO 1 VOLTAGE	R	
S	GDO 1 CURRENT SAMPLE	S	
U	-15 VDC	U	
V	+24.5 VDC RETURN	V	
W	PS 3 RETURN	W	
X	+24.5 VDC	X	
Y	+24.5 VDC	Y	
Z	PS 3	Z	
a	+24.5 VDC RETURN	a	
C	CABLE SHIELD	C	
G	WIRED SPARE	G	
L	SPARE, UNWIRED	L	
M	PS1, PS2 RETURN	M	
P	SPARE, UNWIRED	P	
T	UNWIRED	T	
PIN-b	UNWIRED	PIN-b	


"X" FT. +304.8 -0 12"
1
41.40 1.63 DIA MAX
41.40 1.63 DIA MAX
19.05 .75 DIA. MAX
TO CP (CONTROL PANEL)
MATES WITH SP02A-20-26S OR EQUIVALENT
P1
BENDIX P/N SP06A-20-26P(SR) OR EQUIV.
BENDIX P/N P2 PT06W-20-26S OR EQUIV.
TO LNA (LOW NOISE AMPLIFIER) MATES WITH PT07C-20-26P OR EQUIVALENT

NOTES:

1. PART NO. DASH NOS. CORRESPONDS TO CABLE LENGTH (X) IN FEET, [MAXIMUM LENGTH 200 FT .(61 METERS)]

556342 REV E

Figure 2-3. LNA Power and Control Cable 556342-X (Rev E)

If voltages are correct, set the POWER switches to OFF and connect the LNA power and control cables to the LNA's. If voltages are incorrect, refer to Section IV.

Connect the transfer switch power and control cable (Figure 2-4) to CP connector J6 and to the waveguide-coaxial transfer switch.

2.3 POWER TURN-ON

Connect a Parameter Test Set, if available, to J2 on LNA1. Set CP LNA1, and Parameter Test Set POWER switches to ON. Monitor the PS1, PS2, PS3 and +28 V voltages on the Parameter Test Set. They should indicate as recorded on supplied Test Data Sheet. If a Parameter Test Set is not available, measure the voltages with a digital voltmeter at LNA1 J2 pins as follows:

Power Supply	PS1	PS2	PS3	PS4
J2 Pin to Pin	N to W	F to W	Z to W	Y to V

Perform a similar test with the Parameter Test Set connected to J2 on LNA2. The power supplies being tested are PS5, PS6, PS7, and PS8, respectively, and the voltage Indications should be as given in the above chart.

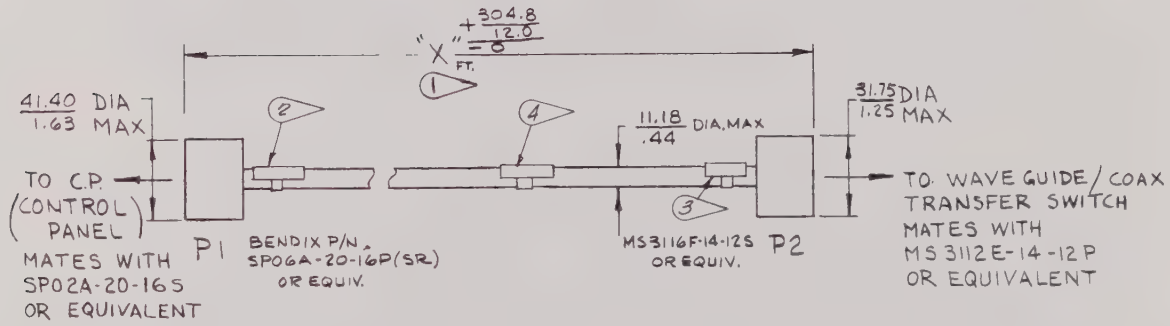
If voltages are incorrect, refer to Section IV.

Note that the POWER ON, MAJOR FAULT, and GDO TEMP FAULT lamps on the front panel of the CP are lit. The MAJOR FAULT lamps turn off when the thermoelectric assemblies reach operating temperatures; the GDO TEMP FAULT lamps turn off when the GDO heat sinks reach operating temperature. Set the CHANNEL SELECTOR switch to LNA1 or AUTO. The LNA1 ON LINE placard should be lit. Also note that the fans on the rear panel are operating. This completes checkout of the CP. Unless operation is desired, set the POWER switches to OFF.

2.4 OPERATION

The only operator functions are to set the POWER switches to ON when operation is desired, to OFF when a shutdown is required, and to set the CHANNEL SELECTOR switch to AUTO, or LNA2 if on-line operation of LNA2 is desired.

TABLE I		
WIRE TERMINATION LIST		
FROM P1		TO P2
PIN-A	LNA 1 } FORM "C" CONTACTS	PIN-A
B	COMMON } FORM "C" CONTACTS	B
C	LNA 2 } FORM "C" CONTACTS	C
D	LNA 1 } FORM "C" CONTACTS	D
E	COMMON } FORM "C" CONTACTS	E
F	LNA 2 } FORM "C" CONTACTS	F
J	COMMAND LNA 1 (-)	J
K	COMMAND COMMON (+)	K
L	COMMAND LNA 2 (-)	L
G	UNWIRED	G
H		H
M		PIN M
N		
P		
R		
PIN-S	UNWIRED	



NOTES:

1. PART NO. DASH NOS. CORRESPONDS TO CABLE LENGTH (X) IN FEET, [MAXIMUM LENGTH 200 FT.(61 METERS)]
2. MARKED "TO C.P.".
3. MARKED "TO S1".
4. MARKED "556343-X"

556343 REV C

1 IN. = 25.40 MM
1 FT = 304.8 MM

THIRD ANGLE PROJECTION

MILLIMETRE≃ INCHES

Figure 2-4. Transfer Switch Power and Control Cable 556343-X (Rev C)

2.5 ELECTRICAL INTERFACE WITH STATUS MONITOR CONNECTOR

Interface with the control panel through status monitor connector J3 (Bendix P/N SPO2A-20-24S) should be made with a cable connector; either Bendix P/N SP06A-20-24P(SR) or PT06A-20-24P(SR). Refer to Figure 3-2.

A. To switch LNA channel to on-line from remote location:

1. Control panel CHANNEL SELECTOR switch in AUTO position.

2. LNA to be selected must not have a major fault (cannot remotely switch a major fault LNA on-line).

3. At J3, momentarily connect (500 ms min):

   Pins A and C to switch LNA1 on-line or pins B and C to switch LNA2 on-line (while pins A and C or B and C are connected control panel auto switching disabled).

Auto switching position: control panel will automatically switch LNA's if on-line LNA develops major fault.

(Maximum loop resistance 2 ohms)

B. To Monitor or use voltages generated in control panel:

1. Pin D (+20 to +28 Vdc) generated by LNA1 power supply (P4). If LNA1 ac power turned off, this voltage is turned off. (0.4 ampere external load maximum) (Lead used to light remote power-on indicator.)

2. Pin E (+20 to +28 Vdc) generated by LNA 2 power supply (PS8). If LNA2 ac power turned off, this voltage is turned off (0.4 ampere external load maximum) (Lead used to light remote power-on indicator.)

3. Pin N (+20 to +28 Vdc) generated by LNA1 and LNA2 in common. Both LNA1 and LNA2 ac power turned off before this voltage is turned off. (0.4 ampere external load maximum.) (Lead used to supply remote fault indicators.)

4. Pin C common return for all voltages on connector J3.

C. To monitor MAJOR FAULT indication:

1. Pins R, S, and T for LNA1 (fail safe, form C dry contacts).

   Pins R and S continuity only if LNA1 is in major fault. fault.

   Pins S and T continuity only if LNA1 is not in major fault.

2. Pin F +20 to +28 Vdc with respect to pin C if LNA1 not in major fault. (Lead used to light remote major fault indicator.)

   Pin F 0 Vdc with respect to pin C if LNA1 is in major fault.

3. Pins U, V, and W for LNA2 (fail safe, form C dry contacts).

   Pins U and V continuity only if LNA2 is in major fault.

   Pins V and W continuity only if LNA2 is not in major fault.

4. Pin G +20 to +28 Vdc with respect to pin C if LNA2 not in major fault.

   Pin G 0 Vdc with respect to pin C if LNA2 in major fault. (Lead used to light remote major fault indicator.)

D. To monitor GDO TEMP FAULT indication:

1. Pins X and Y for LNA1 (form A dry contacts).

   Pins X and Y continuity only if LNA1 is in GDO temp fault.

2. Pin H +20 to +28 Vdc with respect to pin C if LNA1 not in GDO temp fault.

   Pin H 0 Vdc with respect to pin C if LNA1 in GDO temp fault. (Lead used to light remote GDO TEMP FAULT indicator.)

3. Pins a and Z for LNA2 (form A dry contacts).

   Pins a and Z continuity only if LNA2 is in GDO temp fault.

4. Pin J +20 to +28 Vdc with respect to pin C if LNA2 not in GDO temp fault.

   Pin J 0 Vdc with respect to pin C if LNA2 in GDO temp fault. (Lead used to light remote GDO TEMP FAULT indicator.)

E. To Monitor LNA that is on-line:

1. Pins K, L, and M (fail safe, form C dry contacts).

2. Pins K and M continuity only if LNA1 on-line

   Pins L and M continuity only if LNA2 on-line

SECTION III
PRINCIPLES OF OPERATION

3.1 POWER SUPPLIES

The eight power supplies used in the CP are all of solid state design, fully regulated with current limiting for protection of both the power supply and load. The transformers are capable of operating on 115/230 Vac ±14 percent, 47 to 440 Hz. The LNA, however, restricts operation to 47 to 63 Hz. The CP transformers are factory wired for the voltage of the LNA with which the CP will operate. Power supply regulation is ±0.05 percent for line voltage change, and ±0.1 percent maximum for load change.

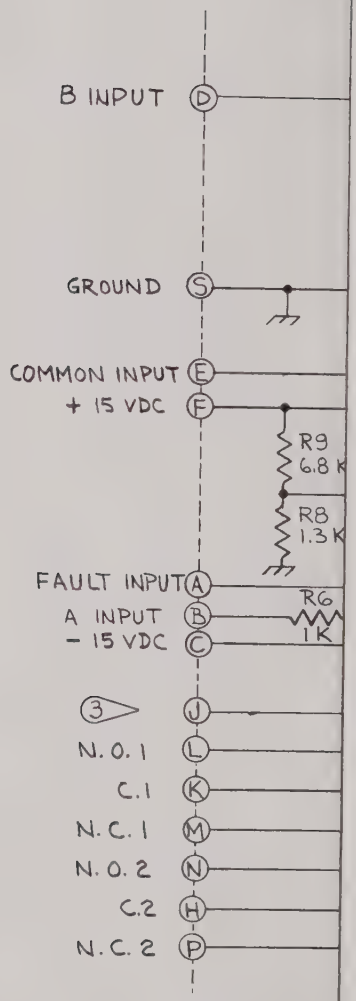
Current limiting is factory set at 130 percent of full load current rating. Output voltages can be set in the ranges listed in Table 1-1. They should, however, be adjusted to the values given in Section II under the conditions stated. A clockwise turn of the control variable resistor on each power supply increased output voltage (refer to Section IV).

3.2 GDO FAULT LOGIC ASSEMBLY

Figure 3-1 is a schematic diagram of the GDO fault logic assembly A1A1 or A1A2 for LNA1 and A2A1 or A2A2 for LNA2. The assemblies are identical. On 556335-3, -4 control panels (A1/A2) the A2 card is not supplied. Contacts 7 and 8 are strapped at A1/A2) E7 and E8. The input voltages are +15 V, -15 V, GDO voltage and GDO current samples from the LNA, and +11 V from CP PS3/PS7. The output signal is obtained by relay contact closures; that is, the contact sets 2, 3, and 4, and 6, 7, and 8 of K1. When the relay is not energized, contact sets 2 and 4, and 8 and 6 are closed; when the relay is energized, contact sets 2 and 3 and 8 and 7 are closed. Contact set 6, 7, and 8 is available at station monitor connector J3. Contacts 2 and 4 are used for the MAJOR FAULT indicator in the CP.

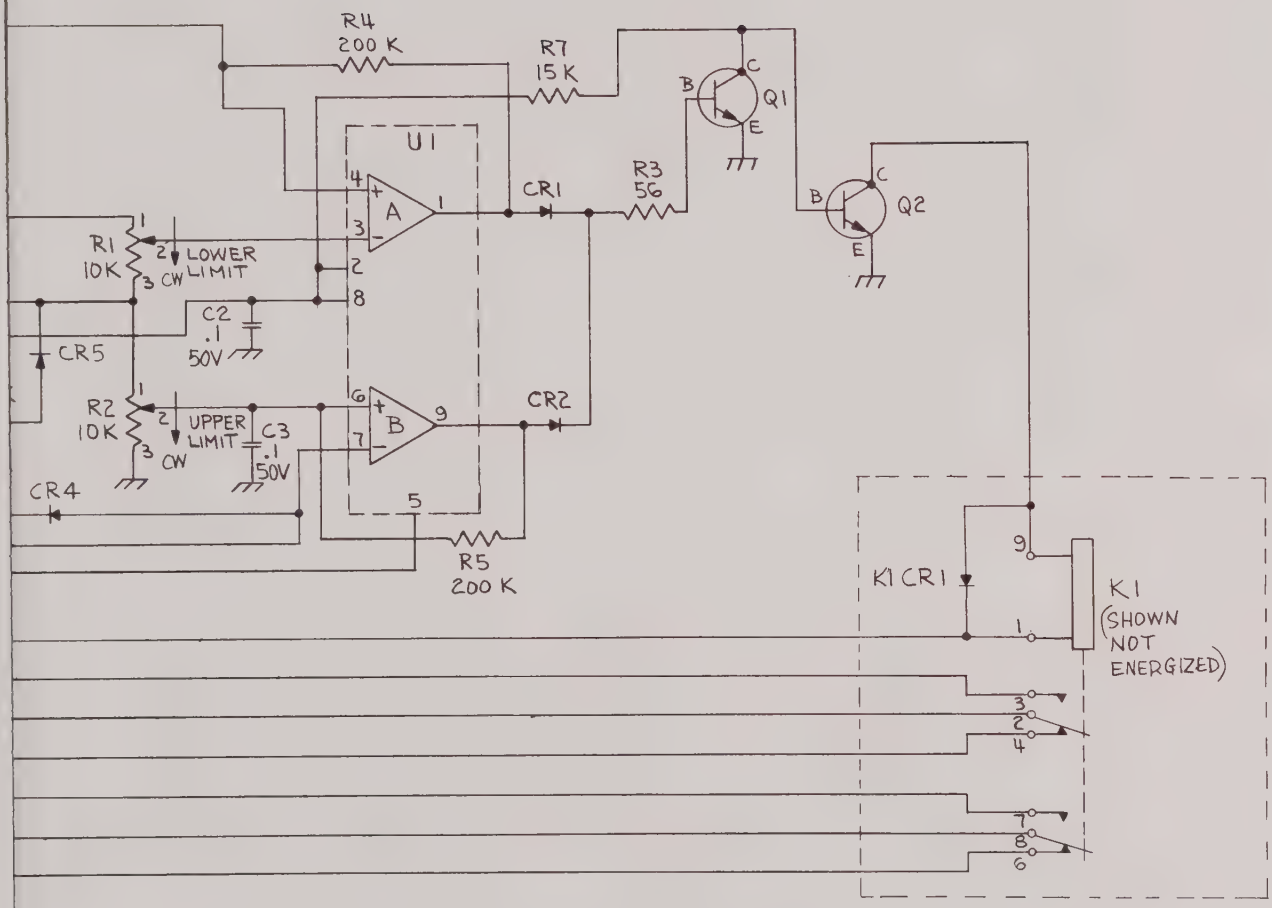
During normal operation, relay K1 (Figure 3-1) is energized by +11 V through the relay coil to transistor Q2 collector to ground. The base of Q2 has +15 V applied through resistor R7 and, therefore, Q2 saturates.

When IC voltage comparator U1 produces a positive signal, indicating a MAJOR FAULT, transistor Q1 (Figure 3-1) saturates thus removing the voltage at the base of transistor Q2 which then stops conducting, deenergizing the relay coil. This causes the relay contact closure to switch from contacts 7 and 8 to contacts 6 and 8 causing a fault indication at J3, and also from contacts 2 and 3 to contacts 3 and 4 causing a MAJOR FAULT indication.



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   INTEGRATED CIRCUIT U1 IS TYP
   CAPACITOR VALUES ARE IN U
   RESISTOR VALUES ARE IN OHM
   DIODES CR1 THRU 5 ARE IN40
   TRANSISTOR Q1, Q2 - TYPE 2
2. PARTIAL REFERENCE DESIGNAT
   FOR COMPLETE DESIGNATION P
   NUMBER OR SUBASSEMBLY DES
3. FOR 553842-1 ASSY INPUT AT "J
   FOR 553842-2 ASSY INPUT AT "J



PE MA747
F.
S.
01
N 2222
TIONS ARE SHOWN.
REFIX WITH UNIT
IGNATION.
CAN BE +9 TO +6 VDC
CAN BE +18 TO +32 VDC

553840 REV D

Figure 3-1. GDO Fault Logic Assembly, Schematic Diagram 553840 (Rev D)

Pin A of the logic card (Figure 3-1) is connected through thermostat S5 (in the LNA) to ground. When the LNA thermoelectric cooler temperature is below the specified operating temperature range (-12^{O}C), the thermostat is open. When the temperature rises above -12^{O}C, the thermostat closes and shorts the U1A input to ground. This produces a positive signal causing relay K1 to switch contacts to MAJOR FAULT.

The LNA GDO current is sampled at pins B/D (Figure 3-1). If this voltage varies out of its preset range, amplifier U1 produces a positive signal causing relay K1 to deenergize (MAJOR FAULT).

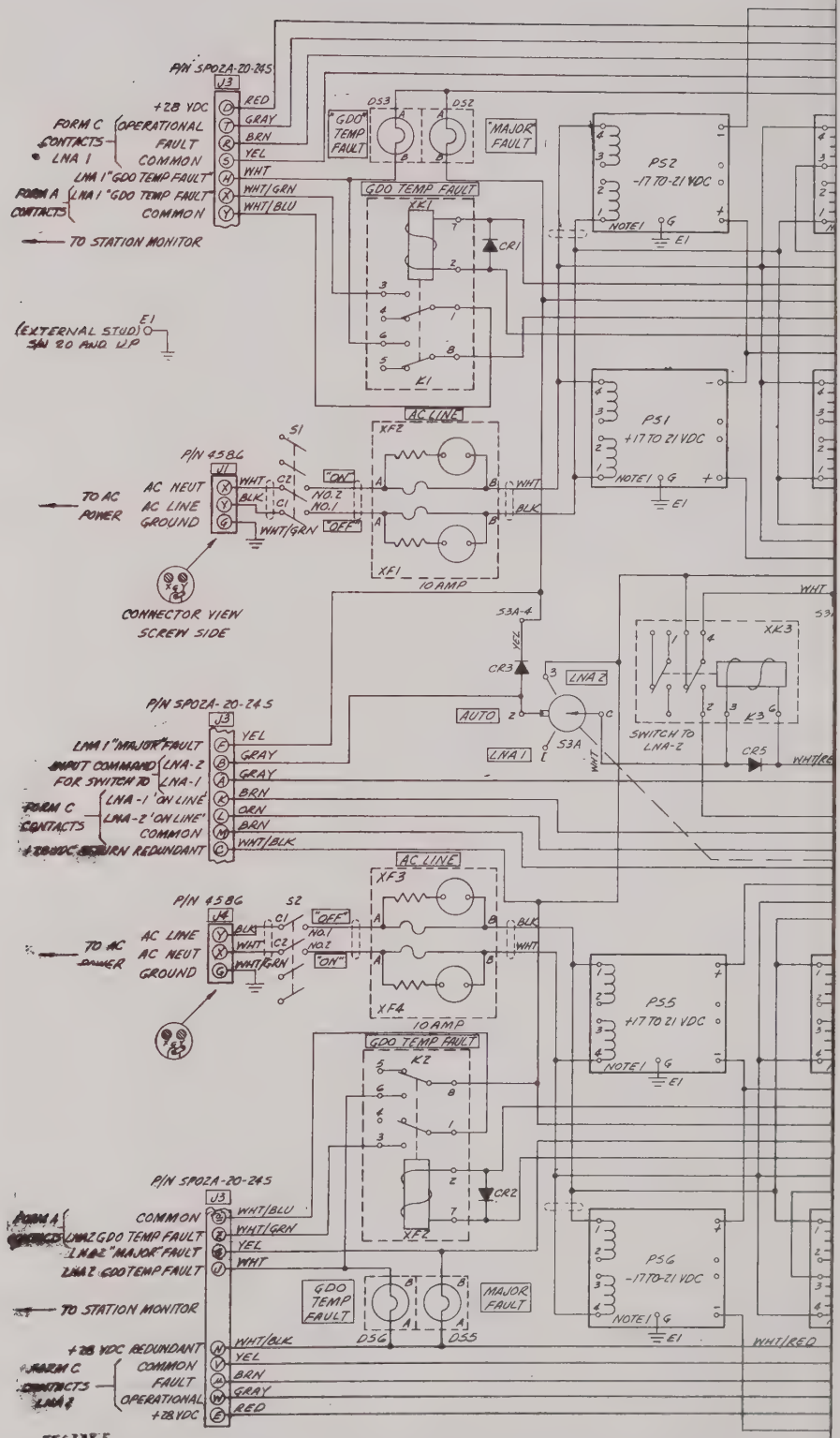
The LNA GDO voltage is sampled at pin E. In a similar manner, if this voltage varies out of its preset range, U1 produces a positive signal and relay K1 deenergizes (MAJOR FAULT).

Station monitor connector J3, pins R, S, and T for LNA1, and u, V, and W for LNA2, are form C contact sets that can be monitored with an ohmmeter to determine the status of the logic cards. During normal operation, J3 pins S/V to T/W should show closed circuit (LNA operational) and pins R/u to S/V open circuit. When a fault occurs, pins T/W to S/V are open and pins R/u to S/V are closed (LNA fault). The CP MAJOR FAULT indicator operates in a parallel circuit and observation of the lamp indicates LNA status.

Variable resistors R1 and R2 (Figure 3-1) (LOWER LIMIT and UPPER LIMIT), permit selection of the upper and lower voltage limits at which voltage comparator U1 will produce a positive output. A change in LNA GDO current causes the input voltage at pins B/D to change, whereas the pin E input voltage remains fixed. This, if large enough, causes relay K1 to switch. A GDO current change indicates a GDO RF power change and, therefore, a stage gain change in the LNA

3.3 GDO TEMPERATURE FAULT

Pin B of CP connector J2/J5 is connected through LNA thermostats S2 and S3 to circuit ground. When the LNA GDO heat sink is within the specified operating temperature range, both thermostats are open circuit. When the temperature exceeds the range in either direction, a thermostat closes (short circuits to ground) and operates relay K1/K2 in the CP (Figure 3-2). Contact set 6 and 8 of relay K1/K2 operate the GDO TEMP FAULT indicator and contact set 1 and 3 is a form A contact pair available at CP connector J3 (X, Y and A, Z).



556338 F

NOTES:

1. ALL RELAYS SHOWN DE-ENERGIZED. SWITCHES S1 & S2 SHOWN IN "OFF" POSITION. SWITCH S3 SHOWN IN "AUTO" POSITION. DS2,3,5,6,7 & 8 ARE P/N 387 LAMPS. DS1 & 4 ARE P/N 507-4861-3735-500, DIALCO-LED. FOR PS1 THRU PS8; 120 VAC OPERATION STRAP 1 TO 3 & 2 TO 4, 240 VAC OPERATION STRAP 2 TO 3 ONLY.

A1 & A2 P/N 556315-1 (SCHEMATIC 556318)

PS1,2,5 & 6 P/N S-318 RB ↻ } INCREASES VOLTAGE

PS3 & 7 P/N S-317 RB ↻ } INCREASES VOLTAGE

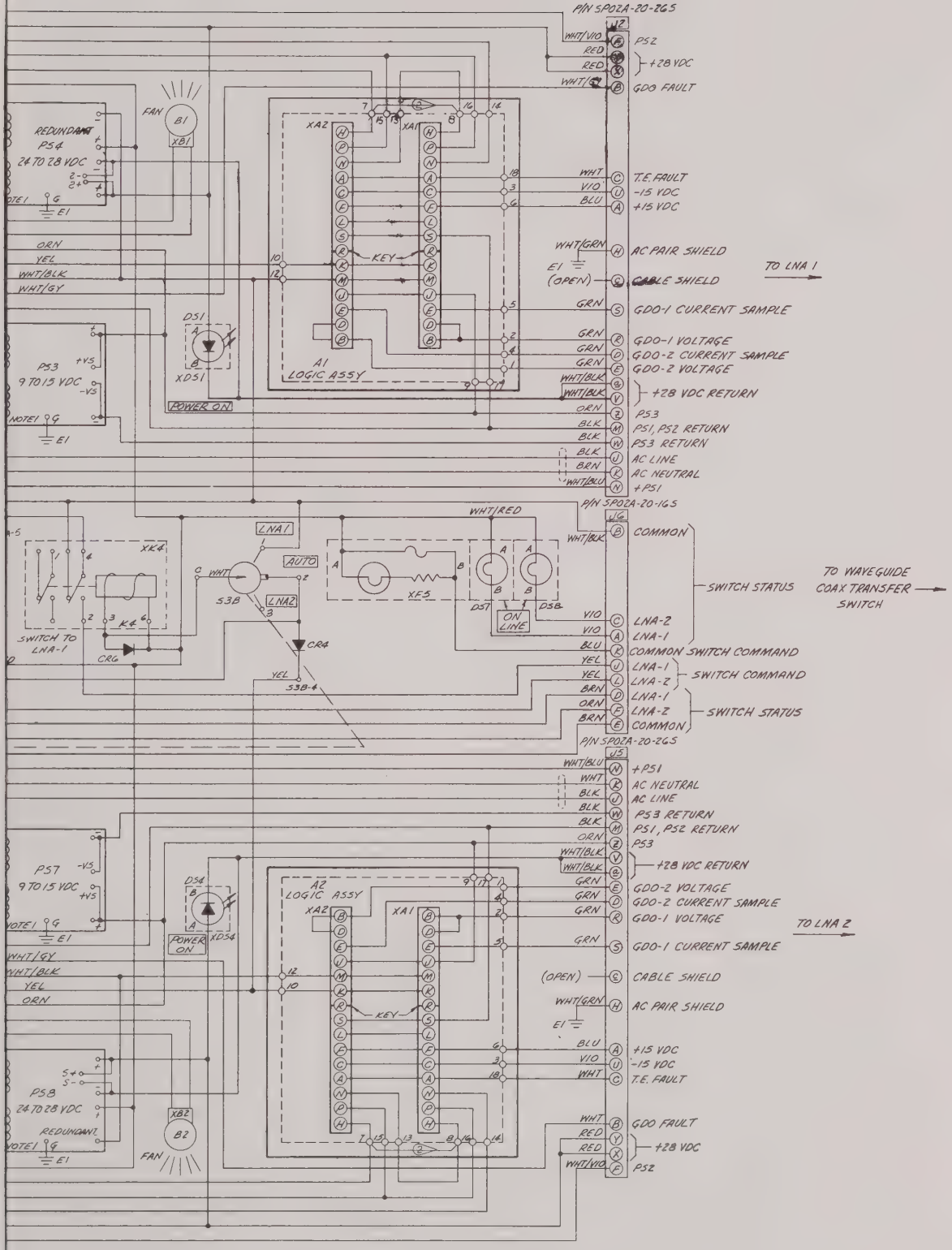
PS4 & 8 P/N S-319 R15 ↻ } INCREASES VOLTAGE

A1/2 A1, A2 P/N 553842-1 FAULT LOGIC (SCHEMATIC 553840)

R1 ↻ DECREA

R2 ↻ INCREA

CONT'D



NOTES CONT'D:

(3) IF A2 CARD IS NOT USED BECAUSE LNA DOES NOT HAVE SECOND STAGE PARAMP, A1-7 IS STRAPPED TO A1-8, A2-7 IS STRAPPED TO A2-8. (USED ON J-3/4 CONTROL PANELS)

SE LOWER LIMIT
SE UPPER LIMIT

556338 REV G

Figure 3-2. Redundant Control Panel, Schematic Diagram 556338 (Rev G)

3.4 SELECTION OF LNA FOR ON-LINE OPERATION

CHANNEL SELECTOR switch S3 (Figure 3-2 is used to select the LNA for on-line operation. When in the AUTO position, however, S3 in conjunction with relays K3 and K4 enables automatic LNA switching when a fault occurs. If a fault occurs in one LNA channel the GDO logic assembly (A1 for LNA1 or A2 for LNA2) senses a change in current in the associated GDO in the LNA. This generates an output signal that lights the MAJOR FAULT indicator and energizes relays K3 and K4 to switch LNA's.

In either channel position of CHANNEL SELECTOR switch S3, +24.5 V (PS4/PS8 output voltage) is applied through the switch. Actually, setting S3 to the selected channel position energizes the appropriate relay (K3 or K4) by grounding the circuit. The relay contact closure then completes the circuit for applying +24.5-Vdc power to the waveguide-coax transfer switch, which incorporates a latching circuit. Thus, the applied power causes the transfer switch to be activated and change state. When the transfer switch latches in the new position, the latching relay opens the +24.5-Vdc power line so that no dc power is present in the transfer switch during the normal LNA operational period. The transfer switch remains in the new state and does not draw power from the system.

When CHANNEL SELECTOR switch S3 is set to AUTO, the transfer switch remains in the ON-LINE LNA position. If a fault occurs in the on-line LNA, the system will automatically switch to the standby LNA, provided it is operational. The wiring arrangement of relays K3 and K4 is such that if a fault occurs in the off-line LNA, a subsequent fault in the on-line LNA will not cause the system to switch until the fault in the off-line LNA is corrected. This inhibitive arrangement is used to prevent the transfer switch from oscillating between the two LNA's when both have faults. When S3 is set to either LNA1 or LNA2 position, the automatic switching feature is overriden.

If a fault occurs in any one of the following circuits in the on-line LNA, the system will automatically change LNA's if S3 is set to the AUTO position.

- Any power supply failure
- +15 V supply failure in LNA
- -15 V supply failure in LNA
- GDO current fault in LNA
- Thermoelectric cooler over temperature

SECTION IV
MAINTENANCE

4.1 FAN AND COOLING

The fans mounted on the rear panel of the CP are of long-life design, but can wear out. Inspect them periodically for noise or vibration and for oil leaks from the bearing. If either condition is found, remove and replace the faulty fan.

For protection of personnel and for adequate cooling of the assembly, the protective cover must be kept in place while the CP is operating. The CP must be installed in such a position that air can flow through the ventilating holes in the protective cover and in the sides and bottom of the chassis.

4.2 ADJUSTMENT OF FAULT LOGIC CARDS

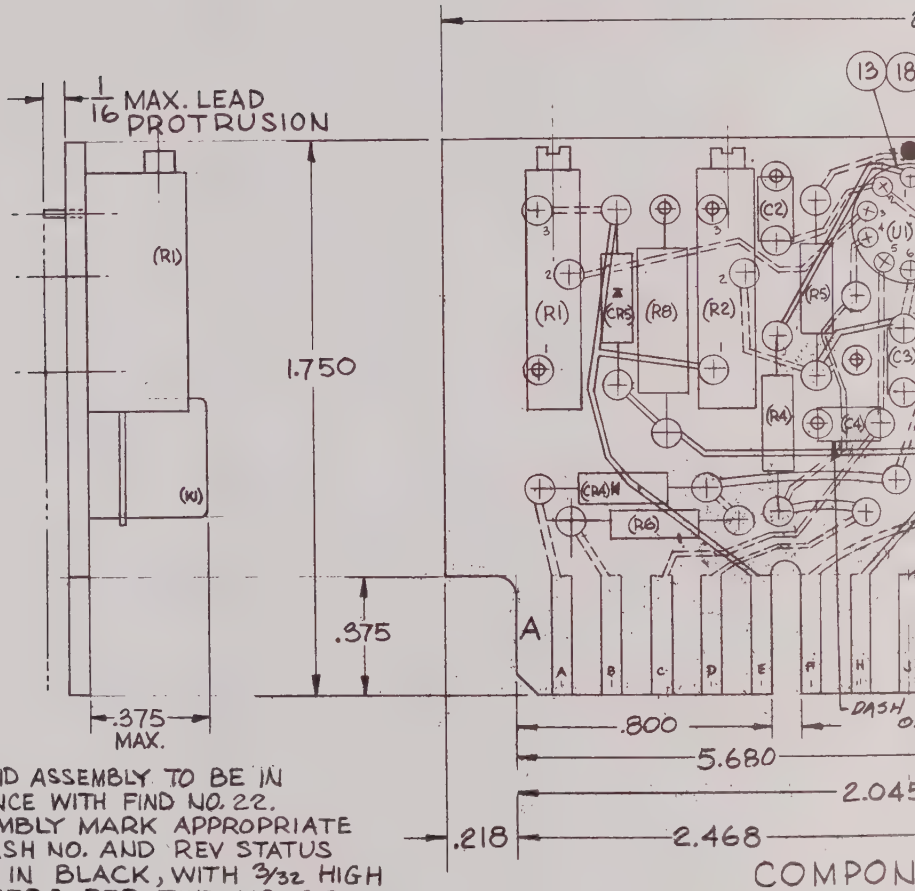
The four logic cards A1A1, A1A2, A2A1, and A2A2 in logic assemblies A1 and A2 can be adjusted while the protective cover is in place and the CP is operating. (Control panels 556335-3, -4 do not use A1A2 or A2A2 cards). There are two square holes (marked FAULT) in the protective cover that permit insertion of a screwdriver to adjust the trim pots as required (Figure 2-1). The GDO fault logic assembly is shown in Figure 4-1. Figure 3-1 is the schematic diagram. If a logic card is replaced or if a GDO in an LNA is replaced, recalibration of the appropriate card-mounted amplifier, U1, may be necessary. Proceed as follows:

a. Turn adjustments on variable resistors R1 (LO) and R2 (HI) fully clockwise (MAJOR FAULT indication off). On the CP protective cover the access holes to these resistors are marked A1A2, A1A1 LO, HI FAULT, and A2A1, A2A2 HI, LO FAULT, respectively.

b. Monitor the MAJOR FAULT lamp on the CP.

c. Turn R2 adjustment counterclockwise (one-quarter turn at a time) until relay K1 deenergizes (MAJOR FAULT indication lit); then turn the adjustment one full turn clockwise. (MAJOR FAULT indication turns off.)

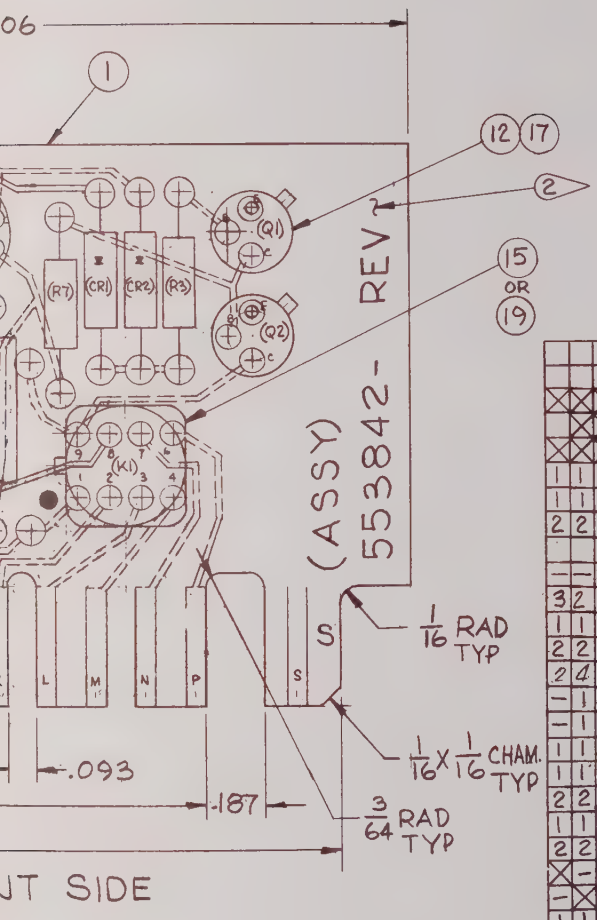
d. Turn R1 adjustment counterclockwise (one-quarter turn at a time) until relay K1 deenergizes (MAJOR FAULT lit); then turn the adjustment one full turn clockwise (MAJOR FAULT off).



NOTE:

1. WIRING AND ASSEMBLY TO BE IN ACCORDANCE WITH FIND NO. 22.
2. AT ASSEMBLY MARK APPROPRIATE ASSY DASH NO. AND REV STATUS LETTER, IN BLACK, WITH 3/32 HIGH CHARACTERS PER FIND NO. 20.
3. FOR ASSY 553842-1 AND -2 USE FIND NO. 11(4) PLACES AS SHOWN, CR1, CR2, CR4, CR5 FOR ASSY 553842-3, USE ONLY (2) OF FIND NO. 11; CR1, AND CR2 AS SHOWN.
4. FOR ASSY 553842-1 & -2 USE ONLY C2 & C3. FOR ASSY 553842-3 USE C2, C3 & C4.

556012 REV L



-5	-4	-3	-2	-1	PART OR IDENT NO.	CODE IDENT NO.	NOM OR DESCR	SPEC/MATL	SYM/NOTES	AIL PART NO.	FIND NO.
QTY REQD					PARTS LIST						
		X	—	—			G.D.O. FAULT LOGIC ASSY		- -	556012 3	—
			X	—			G.D.O. FAULT LOGIC ASSY			556012 -2	—
				X			G.D.O. FAULT LOGIC ASSY			556012 -1	—
		X	—	—			G.D.O. FAULT LOGIC ASSY		- -	556012 3	—
			X	—			G.D.O. FAULT LOGIC ASSY			556012 -2	—
				X			G.D.O. FAULT LOGIC ASSY			556012 -1	—
		X	X	X			BOARD, PRTD WRG			553841-1	1
		X	X	—			SCHEMATIC DIAG		(REF)	553840	2
		X	—	—			SCHEMATIC DIAG		(REF)	553854	3
							WORKMANSHIP SPEC		(1)	980075	22
							TEST PROC			359146	21
							MARKING SPEC		(2)	980024-1	20
1	1	—			712DM-26		RELAY (18-32VDC)	TELEDYNE	K1		19
1	1	1			10228		PAD	M. ROSS			18
2	2	2			10091		PAD, TRANSISTOR	M. ROSS			17
											16
—	—	1			712DM-12		RELAY (9-16VDC)	TELEDYNE	K1		15
3	2	2			M39014/01-1553		CAPACITOR	.1UF 50V	C2,3,4	(4)	14
1	1	1			UA747HC		INTEGRATED CKT	FAIRCHILD	U1		13
2	2	2			2N2222		TRANSISTOR		Q1, Q2		12
2	4	4			1N4001		DIODE		(3)		11
—	1	1			RCR20G132JS		RESISTOR	1.3KΩ ½ W	R8		10
—	1	1			RCR20G682JS		↑	6.8KΩ ½ W	R9		9
1	1	1			RCR07G153JS		↑	15KΩ ¼W	R7		8
1	1	1			RCR07G102JS		↑	1KΩ ¼W	R6		7
2	2	2			RCR07G204JS		↓	200KΩ ¼W	R4, R5		6
1	1	1			RCR07G560JS		RESISTOR	56Ω ¼W	R3		5
2	2	2			3005P-1-103		RESISTOR, VARI.	BOURNS 10KΩ	R1, R2		4

Figure 4-1. GDO Fault Logic Assembly 556012-1 (Rev L)

NOTE

Both cards (A1A1 and A1A2 or A2A1 and A2A2) control the MAJOR FAULT indicator for one LNA. It is assumed that the adjacent card is operating normally. If in doubt, remove the adjacent card to make the adjustments.

4.3 POWER SUPPLY ADJUSTMENTS

WARNING

When the protective cover is removed from the CP, circuits containing voltages dangerous to life are exposed. Avoid touching any circuit when power is on.

If the power supply voltages as measured with the Parameter Test Set or with a digital voltmeter at the appropriate LNA J2 pins are out of tolerance (Table 1-1), remove the protective cover from the CP. Apply power to the CP and LNA. Monitor the voltage at LNA J2. Refer to paragraph 2.3. Locate the power supplies on Figure 4-2.

4.3.1 POWER SUPPLY PS1/PS5 OR PS2/PS6

To adjust PS1/PS5 to +18 V or PS2/PS6 to -18 V, turn the adjustment screw on variable resistor R8 (Figure 4-3). A clockwise turn increases voltage. Adjust the voltage for +18 ±0.3 V or -18 ±0.3 V.

The other variable resistor on this assembly (PS1/PS5 or PS2/PS6) is the current limit control which is factory set. Do not adjust this control.

4.3.2 POWER SUPPLY PS3/PS7

To adjust PS3/PS7 to +11 V, turn the adjustment screw on variable resistor R8 (Figure 4-4). A clockwise turn increases voltage. Adjust the voltage to +11 ±0.3 V.

The other variable resistor on this assembly (PS3/PS7) is the current limit control which is factory set. This control is not readily accessible and should not be adjusted.

NOTE

Both cards (A1A1 and A1A2 or A2A1 and A2A2) control the MAJOR FAULT indicator for one LNA. It is assumed that the adjacent card is operating normally. If in doubt, remove the adjacent card to make the adjustments.

4.3 POWER SUPPLY ADJUSTMENTS

WARNING

When the protective cover is removed from the CP, circuits containing voltages dangerous to life are exposed. Avoid touching any circuit when power is on.

If the power supply voltages as measured with the Parameter Test Set or with a digital voltmeter at the appropriate LNA J2 pins are out of tolerance (Table 1-1), remove the protective cover from the CP. Apply power to the CP and LNA. Monitor the voltage at LNA J2. Refer to paragraph 2.3. Locate the power supplies on Figure 4-2.

4.3.1 POWER SUPPLY PS1/PS5 OR PS2/PS6

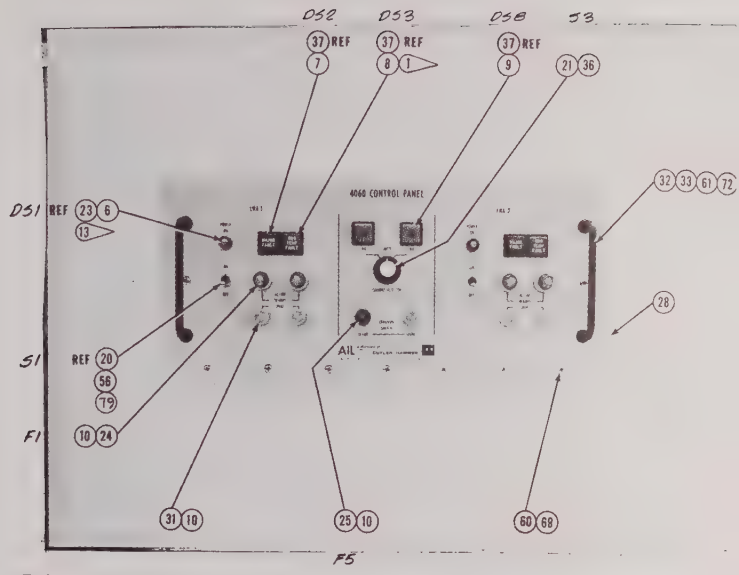
To adjust PS1/PS5 to +18 V or PS2/PS6 to -18 V, turn the adjustment screw on variable resistor R8 (Figure 4-3). A clockwise turn increases voltage. Adjust the voltage for +18 ±0.3 V or -18 ±0.3 V.

The other variable resistor on this assembly (PS1/PS5 or PS2/PS6) is the current limit control which is factory set. Do not adjust this control.

4.3.2 POWER SUPPLY PS3/PS7

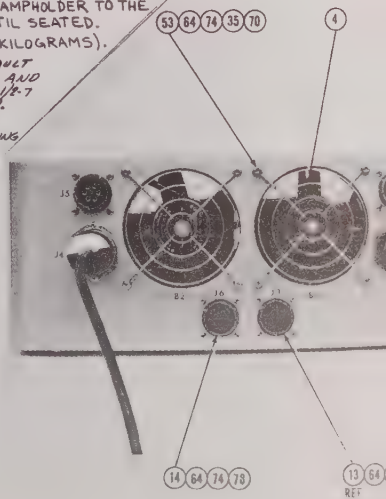
To adjust PS3/PS7 to +11 V, turn the adjustment screw on variable resistor R8 (Figure 4-4). A clockwise turn increases voltage. Adjust the voltage to +11 ±0.3 V.

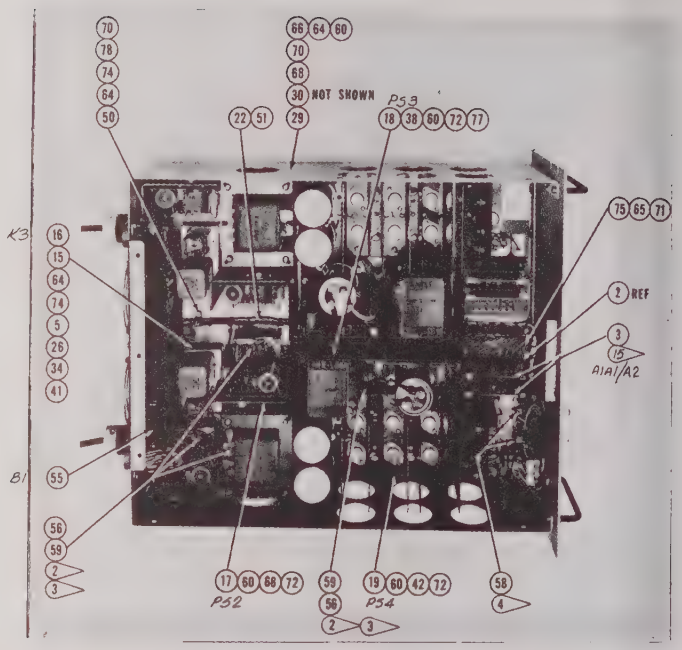
The other variable resistor on this assembly (PS3/PS7) is the current limit control which is factory set. This control is not readily accessible and should not be adjusted.



NOTES :

1. F/N 7,8,9 (DS 2,3,5,6,7,8) DO NOT OVER TIGHTEN MOUNTING CLAMP SCREWS - PLASTIC TYPE CASE.
2. PS1 THRU PS8 - FOR 120 VAC OPERATION STRAP 1 TO 3 AND 2 TO 4 -1/3 CONTROL PANEL
   FOR 240 VAC OPERATION STRAP 2 TO 3 ONLY. -2/4 CONTROL PANEL
3. F/N 56 (RTV 738) USED TO COAT ALL EXPOSED AC TERMINALS PS1 THRU PS8/T1 TERMINAL 1,2,3,4 AND S1/2.
4. F/N 58 (HEAT SHRINK TUBING) USED TO COVER XF1 THRU 4 EXPOSED AC TERMINALS (1 3/4" PER SECTION)
5. F/N 54 (AC POWER CABLE) 8 FT LENGTH PROVIDED WITH WALL PLUG FOR 120 VAC REMOVE AND REPLACE WITH PROPER PLUG FOR 240 VAC OPERATION.
6. ASSEMBLE IN ACCORDANCE WITH FIND NO. 57.
7. FOR REFERENCE PART OF 55G386-2&-3 (F/N's 51 & 22).
8. FOR REFERENCE PART OF 55G386-3 (F/N 22).
9. FOR REFERENCE MATES WITH J1 AND J4.
10. FOR REFERENCE MATES WITH J2 AND J5.
11. FOR REFERENCE MATES WITH J3.
12. FOR REFERENCE MATES WITH J6.
13. BEFORE INSTALLING LAMPHOLDER (F/N 23) IN PANEL THREAD METAL NUT ONTO BODY OF LAMPHOLDER TO THE VERY END OF THREADED AREA UNTIL SEATED.
14. WEIGHT : 82 POUNDS (37.2 KILOGRAMS).
15. ON-34-4 UNITS INSTALL GDO FAULT LOGIC CARDS IN POSITION A1XA1 AND A2XA1 POSITIONS ONLY. STRAP A1/2-7 TO A1/2-8. USE BUSS WIRE, F/N 59.
16. ON PS3, PS4, PS7 & PS8, STRAP SENSE TERMINALS TO CORRESPONDING OUTPUT TERMINALS. USE BUSS WIRE, F/N 59.
17. F/N 16 IS ELECTRICALLY & PHYSICALLY INTERCHANGABLE WITH F/N 80

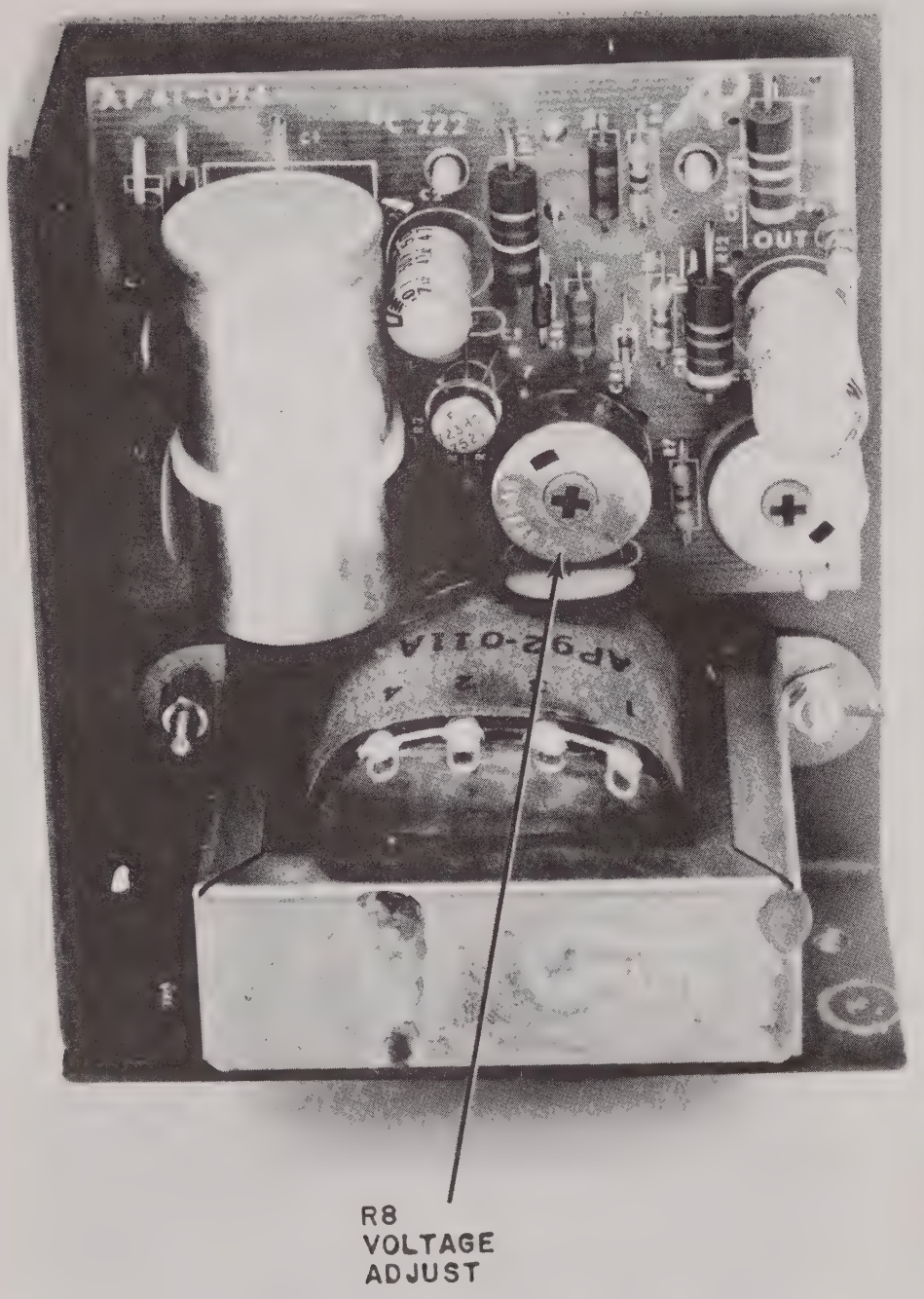




QTY REQ'D				PART OR IDENT NO.	CODE IDENT NO.	NOM OR DESCR	SPEC/MATL	SYM/NOTES	AIL PART NO.	FIND NO.
										90
										89
										88
										87
										86
										85
										84
										83
										82
2	2	2	2			RELAY, DPDT	POTTER & BRUMFIELD	K3, K4	(17)	81
2	2	2	2			SWITCH FINGER GUARD			558382-1	80
23	23	23	23	MS35649-264		NUT	NO. 6			79
9	9	9	9	MS35650-304		NUT	NO. 10			78
										77
16	16	16	16	MS35338-135		WASHER, LOCK	NO. 4			76
47	47	47	47	MS35338-136		WASHER, LOCK	NO. 6			75
										74
27	27	27	27	MS35338-138		WASHER, LOCK	NO. 10			73
8	8	8	8	MS15795-803		WASHER, FLAT	NO. 4			72
11	11	11	11	MS15795-805		WASHER, FLAT	NO. 6			71
										70
11	11	11	11	MS15795-808		WASHER, FLAT	NO. 10			69
										68
8	8	8	8	MS51960-65		SCREW FT HD	10-32 X 1/2 LG 82°			67
16	16	16	16	MS51957-14		SCREW	4-40 X 5/16 LG			66
39	39	39	39	MS51957-30		SCREW	6-32 X 1/2 LG			65
4	4	4	4	MS51957-45		SCREW	8-32 X 1/2 LG			64
										63
2	2	2	2	MS51958-64		SCREW	10-32 X 5/8 LG			62
33	33	33	33	MS51958-63		SCREW	10-32 X 1/2 LG			61
20 IN	20 IN	20 IN	20 IN			WIRE BUSS	20 AWG	(2)	990080-8	60
9 IN	9 IN	9 IN	9 IN	FP 301-1/2		HEAT SHRINK TUBING	ECC	(4) (FOR XF1-4)		59
						WORKMANSHIP			980075	58
2 OZ	2 OZ	2 OZ	2 OZ	RTV 738		SILASTIC	DOW CORNING	(3)		57
2	2	2	2	16-170-672		FAN LINE CORD	HOWARD	XB1, XB2		56
2	2	2	2			CABLE ASSY POWER	(9) (5)	W1,2	359442-1	55
8	8	8	8	16-585-406		CLIP, FASTENING	HOWARD	FOR B1, B2		54
										53
										52
1	1	1	1			HARNESS, LNA2		(6)	556386-2	51
-2	-	-	-	PART OR IDENT NO.	CODE IDENT NO.	NOM OR DESCR	SPEC/MATL	SYM/NOTES	AIL PART NO.	FIND NO.
QTY REQ'D				PARTS LIST						

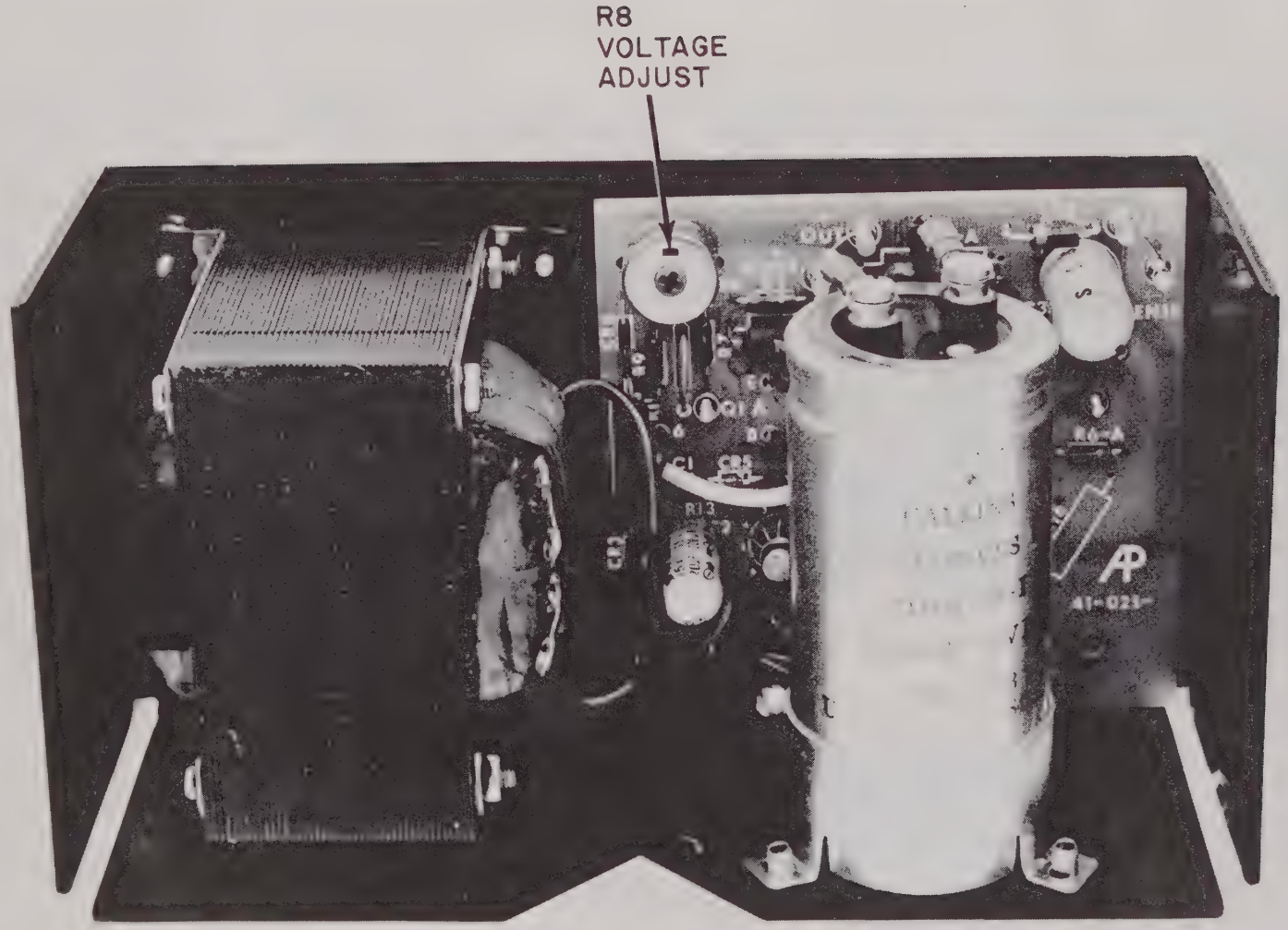
QTY REQ'D				PART OR IDENT NO.	CODE IDENT NO.	NOM OR DESCR	SPEC/MATL	SYM/NOTES	AIL PART NO.	FIND NO.
3	3	3	3	HP-10N		CLAMP, CABLE	BUENDY			50
-	-	-	-			CABLE, SWITCH		(12)	556343-X	49
-	-	-	-	PT06A-20-16P(SR)		CONNECTOR	BENDIX	(12)		48
-	-	-	-	PT06A-20-24P(SR)		CONNECTOR	BENDIX	(11)		47
-	-	-	-			CABLE, LNA		(10)	556342-X	46
-	-	-	-	PT06A-20-26P(SR)		CONNECTOR	BENDIX	(10)		45
-	-	-	-	4579C		CONNECTOR	HUBBELL	(9)		44
-	-	-	-			KIT, SPARE PARTS			556393-1	43
8	8	8	8	C31758-1032-24		NUT RETAINER, J TYPE	TINNERMANN	FOR PS4,8		42
-	-	-	-	20C176		SPRING, HOLD DOWN	P&B	FOR K1,2 (7)		41
X	X	X	X			WIRE RUNNING LIST		REF	556385	40
										39
8	8	8	8	1725-M09-F09-10X32		STAND-OFF	UNICORP	FOR PS3,7		38
-	-	-	-	387		LAMP	REF 28VDC	FOR DS 2,3,5,6,8		37
1	1	1	1	DS70-3-26		KNOB	RAYTHEON	FOR S3		36
2	2	2	2	6-182-026		GUARD, FINGER	HOWARD	FOR B1, B2		35
-	-	-	-			BRACKET, RELAY		(7)	359000-1	34
4	4	4	4			FERRULE			990014-2	33
2	2	2	2			HANDLE			990002-4	32
5	5	5	5	FHN-26G		FUSE HOLDER		SPARE		31
1	1	1	1			COVER			556339-1	30
1	1	1	1			CHASSIS			556332-1	29
1	1	1	1			PANEL, FRONT			556334-1	28
										27
-	-	-	-	77M1P8T		SOCKET, 8 PIN	AMPHENOL	XK1,2,3,4 (7)		26
1	1	1	1	FHL18G1-3		FUSE HOLDER, IND	BUSSMANN	XF5 (3AG 45 1/4)		25
4	4	4	4	FHL176		FUSE HOLDER, IND	BUSSMANN	XF1,2,3,4		24
-	-	-	-	508-873B-504		LED CART. SOCKET	DIALCO	XDS1,4 (7)	(11)	23
1	1	1	1			HARNESS, LNA1	(6)		556386-3	22
1	1	1	1			SWITCH, WAFER		33	359003-1	21
-	-	-	-	7690KB		SWITCH, 4PST	C-H CONTROL	S1,S2 (7)		20
2	2	2	2	S-319		REG. POWER SUPPLY	ADTECH	PS4,8	(16)	19
2	2	2	2	S-317		REG. POWER SUPPLY	ADTECH	PS3,7	(16)	18
4	4	4	4	S-318		REG. POWER SUPPLY	ADTECH	PS1,2,5,6		17
~~2~~	~~2~~	~~2~~	~~2~~	~~B0HR0-6D-26.5 VDC~~		~~RELAY DPDT~~	~~ALLIED CONTROL~~	~~K3,K4~~	(17)	16
2	2	2	2	KRP11D 12VDC		RELAY DPDT	P&B	K1,K2		15
1	1	1	1	SP02A-20-16S		CONN	BENDIX	J6		14
-	-	-	-	SP02A-20-24S		CONN	BENDIX	J3 (8)		13
-	-	-	-	SP02A-20-26S		CONN	BENDIX	J2,5 (7)		12
2	2	2	2	4586		CONN	HUBBEL	J1, J4		11
10	10	10	10	314010		FUSE (10 AMP)	LITTLE FUSE	F1,2,3,4,5		10
2	2	2	2	65210-L63GFG(D387)		"ON LINE"	ELECTRO-MECH	DS 7,8 (1)		9
2	2	2	2	65210-L63AFG(D387)		"GDO-TEMP-FAULT"	ELECTRO-MECH	DS 3,6 (1)		8
2	2	2	2	65210-L63RFG(D387)		"MAJOR-FAULT"	ELECTRO-MECH	DS 2,5 (1)		7
2	2	2	2	507-4861-3735-500		LED, GRN, 28 VDC	DIALCO	DS 1,4		6
2	2	2	2	IN4002		DIODE	CRI THRU CR6 (7)			5
2	2	2	2	3-15-4450		FAN (120) VAC	HOWARD	B1,2		4
2	2	4	4			FAULT LOGIC BRD	(15)	A1A1, A1A2, A2A1, A2A2	553842-1	3
-	-	-	-			MONITOR LOGIC BRD		A1,2 (7)	556315-2	2
X	X	X	X			SCHEMATIC			556338	1
										—
X	-	-	-			CONTROL PANEL	220 VAC (2)		556396-4	—
	X	-	-			CONTROL PANEL	120 VAC (2)		556396-3	—
		X	-			CONTROL PANEL	240 VAC (2)		556336-2	—
			X			CONTROL PANEL	120 VAC (2)		556336-1	—
-5	-4	-3	-2	-1	PART OR IDENT NO.	CODE IDENT NO.	NOM OR DESCR	SPEC/MATL	SYM/NOTES	AIL PART NO.	FIND NO.
QTY REQD					PARTS LIST						

Figure 4-2. Redundant Control Panel Assembly 556336 (Rev F)



80-823

Figure 4-3. Power Supply PS1/PS5, PS2/PS6



80-824

Figure 4-4. Power Supply PS3/PS7

4.3.3 POWER SUPPLY PS4/PS8

To adjust PS4/PS8 to +24.5 V, turn the adjustment screw on variable resistor R15 (Figure 4-5). A clockwise turn increases voltage. Adjust the voltage to +24.5 ±0.5 V.

4.4 TESTS WITH POWER SUPPLIES

4.4.1 POWER SUPPLY PS1/PS5

CP power supply PS1/PS5 provides the input voltage to the LNA +15 V regulator. A test of the +15 V regulator is to vary the PS1/PS5 voltage over the range of +17.5 V to +21 V and note that the +15 V regulator output on the Parameter Test Set, or at LNA J2 connector pins A to W, remains constant within 0.1 V. PS1/PS5 operating voltage should be set to +18 ±0.3 V.

4.4.2 POWER SUPPLY PS2/PS6

CP power supply PS2/PS6 provides the input voltage to the LNA -15 V regulator. A test similar to that described in paragraph 4.4.1 can be used for the -15 V regulator. The LNA J2 connector pins are U to W.

4.4.3 POWER SUPPLY PS3/PS7

CP power supply PS3/PS7 provides the input voltage to LNA voltage regulators VR1 and VR2, which supply the GDO's. A good test of VR1 or VR2 is, therefore, to vary the PS3/PS7 voltage and to monitor the GDO 1 or GDO 2 voltage on the Parameter Test Set. Varying PS3/PS7 voltage from +10.5 V to +15 V should cause no change in the GDO voltage. If a Parameter Test Set is not available measure the voltages at LNA J2 pins as follows:

a. VR1, GDO 1, pins R to W

b. VR2, GDO 2, pins E to W

4.4.4 POWER SUPPLY PS4/PS8

CP power supply PS4/PS8 powers the thermoelectric assembly in the LNA. The LNA first stage temperature controller (assembly A8) regulates the input voltage and uses it as a control reference. Varying PS4/PS8 voltage, therefore, tests assembly A8. Set PS4 voltage to +24.5 V and monitor the first stage temperature at LNA TP3 with a temperature meter. Allow about 10 minutes for possible temperature change. If assembly A8 is

80-825

Figure 4-5. Power Supply PS4/PS8

operating properly the first stage temperature will change not more than $2^{O}C$. The LNA J2 pins for thermocouple TP3 are d and e.

4.5 PRINTED CIRCUIT CARD EXTENDER

A printed circuit (PC) car extender, P/N 553861-1, is available from the manufacturer as optional equipment. The PC card extender enables maintenance personnel to remove the card(s) from assembly A1 or A2 (when the CP protective cover is removed), insert the PC card extender, and remount the card (A1A1, A1A2, A2A1 or A2A2) on the PC card extender. The PC card extender has test points corresponding to the assembly pins as shown in Figures 4-1 and 3-1. The PC card extender is 6-inches long and when inserted in the card socket makes the test points easily accessible for voltage measurements.

APPENDIX A
GLOSSARY OF SYMBOLS AND ABBREVIATIONS

1. Reference Designation Symbols

Reference Designation Circuit Symbols	Description
A	Assembly, Separable or Reparable
	Assembly, Parametric Amplifier
	Assembly, Transistor Amplifier
AR	Amplifier
AT	Attenuator, Fixed
	Attenuator, Variable
	Resistive Termination
	DC Block
	Isolator (Non-reciprocal Device)
B	Fan
	Blower
C	Capacitor
CB	Circuit Breaker
CP	Adapter, Connector
	Adapter, Waveguide-Coaxial
CR	Semiconductor Device, Diode (Rectifier, Zener)
DC	Directional Coupler
DS	Lamp, Incandescent
	Light Source, Light Emitting Diode

Reference Designation Circuit Symbols	Description
E	Terminal (Individual)
	Binding Post
F	Fuse
FL	Filter
GDO	Gunn Diode Oscillator
HR	Heater
HY	Isolator (Nonreciprocal Device)
J	Connector, Receptacle, Electrical Jack
K	Relay
M	Meter
MT	Transducer
P	Connector, Plug, Electrical
PS	Power Supply
Q	Transistor
	Thyristor, Triac
R	Potentiometer
	Resistor
	Resistor, Adjustable
	Resistor, Variable
	Rheostat
RT	Thermistor

Reference Designation Circuit Symbols	Description
S	Switch, Relay
	Switch, Toggle
	Transfer Switch, RF
	Switch, Thermostatic
T	Transformer
TB	Terminal Board
TC	Thermocouple
TP	Test Point
U	Integrated Circuit Package
	Crowbar Package
VR	Voltage Regulator Assembly (Semiconductor)
W	Waveguide
	Waveguide Section
	Cable Assembly, Coaxial
X	Fuseholder
	Lampholder
	Socket
Z	Network, General
	Voltage Regulator (Integrated Circuit Package)
	Voltage Regulator (Packaged Device)

2. Common Abbreviations

Common Abbreviations	Description
AD	Analog to digital
ADJ	Adjust
AC	Alternating current
BCD	Binary coded decimal
CCW	Counterclockwise
CP	Control panel
CW	Clockwise
DA	Digital to analog
DC	Direct current
DVM	Digital voltmeter
GDO	Gunn diode oscillator
GRD	Ground
GND	Ground
IC	Integrated circuit
INC	Increase
LED	Light emitting diode
LCD	Liquid crystal display
LNA	Low noise amplifier
MOS	Metal oxide semiconductor
Pa	Pascals
P/O	Part of
Pump	Gunn diode oscillator (RF power source)

Common Abbreviations	Description
psig	Pounds per square inch gauge
PC	Printed Circuit
PTS	Parameter Test Set
PS	Power supply
SCFPH	Standard cubic feet per hour
SCR	Silicon controlled rectifier
STG	Stage
TE	Thermoelectric
VR	Voltage regulator
μ	10^{-6}
m	10^{-3}

APPENDIX B
CONTROL PANEL POWER SUPPLIES

CONTROL PANEL POWER SUPPLIES

PS1, PS2, PS5, PS6

AIL P/N S-318

	Page
Similar to Adtech "Red Baron" 24V-1A, Adtech AP70-041	B-3
S-318 Make from APS 24-1, Adtech AP80-123	B-4
Parts List, Adtech 16-001 Sheet 1	B-9
Parts List, Adtech 16-001 Sheet 1A	B-10
Parts List, Adtech 16-001-4 Sheet 5	B-11
Schematic, Adtech AP30-032	B-19/ B-20

PS3, PS7

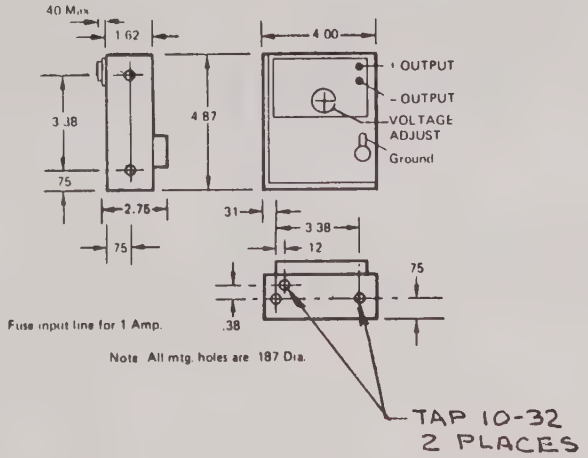
AIL P/N S-317

Similar to Adtech "Black Beauty" 15V-16A, Adtech AP70-040	B-5
S-317 Make from APS 15-6, Adtech AP80-124	B-6
Parts List, Adtech 16-003 Sheet 1	B-12
Parts List, Adtech 16-003 Sheet 1A	B-13
Parts List, Adtech 16-003-3 Sheet 4	B-14
Schematic, Adtech AP30-032	B-19/ B-20

PS4, PS8

AIL P/N S-319

Similar to Adtech "Blue Max" 28V-9A, Adtech AP70-042	B-7
S-319 Make from APS 28-9, Adtech AP80-188	B-8
Parts List, Adtech 16-009 Sheet 1	B-15
Parts List, Adtech 16-009 Sheet 1A	B-16
Parts List, Adtech 16-009 Sheet 1B	B-17
Parts List, Adtech 16-009-8 Sheet 9	B-18
Schematic, Adtech AP30-039	B-21/ B-22



Spec Description

Operating temp range	0^{o} - 50^{o}C
Humidity	0 - 95%
Fungus proof materials and/or coating	
Line voltage	99 to 132 VAC 198 to 264 VAC
Freguency	47-63HZ
Adjustable voltage	
Range	18 - 21VDC
Current	0 to 400ma MAX

ADTEC POWER, INC.

SCALE: ~	APPROVED BY:	DRAWN BY
DATE: 2-17-76		REVISED 2-18-77

POWER SUPPLY
OUTLINE & MOUNTING DIMS

REV B

USED ON
S 318 AIL 24V-1A

DRAWING NUMBER
AP70-041

8½X11 PRINTED ON NO. 1000H CLEARPRINT

REV.	DATE	REVISION RECORD	BY	APPR
A	8-31-79	R2 IS 1.5KΩ WAS 1.3KΩ	JM	

S-318 -

MAKE FROM APS 24-1

CHANGE VALUE OF FOLLOWING PARTS:

R1-A	.75Ω 2W 5%
R2	1.5KΩ ½W 5%
R7	470Ω ½W 5%
R8	1KΩ 2W POTENTIOMETER
R9	1.6KΩ ½W 5%

PC BOARD TO BE HUMISEALED

CHASSIS TO BE MODIFIED PER DWG. AP70-041 (A SIZE).

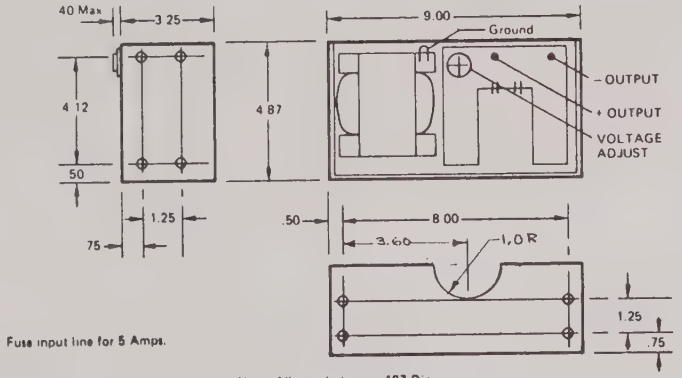
NOTE:

1. VOLTAGE RANGE - 18-21 VDC.
2. CURRENT - .40 AMPS.

ADTECH POWER, INC.
ANAHEIM, CALIF.

REVISIONS	TITLE			
	S-318 MAKE FROM APS 24-1			
5-11-78				
DRAWN BBeck / CHECKED / APPROVED	SCALE N/A	DRAWING NO. AP80-123	Rev. A	

BISHOP GRAPHICS, INC
REORDER NO 20540



Fuse input line for 5 Amps.

Note: All mtg. holes are .187 Dia.

Spec Description

Operating temp range	0^{o} - 50^{o}C
Humidity	0 - 95%
Fungus proof materials and/or coating	
Line voltage	99 to 132 VAC 198 to 264 VAC
Frequency	47-63HZ
Adjustable voltage Range	11 to 15VDC
Current	0 to 3.5AMP

SCALE: ~	APPROVED BY:	DRAWN BY BHH
DATE: 2-17-76		REVISED 10-11-76
POWER SUPPLY OUTLINE & MOUNTING DIMS		REV A
USED ON S 317 AIL 15V-6A		DRAWING NUMBER AP 70-040

8½X11" PRINTED ON NO. 1600H CLEARPRINT

S-317 -

MAKE FROM APS 15-6

CHANGE VALUE OF FOLLOWING PARTS

R1-A	.25Ω 5W 5%
R1-B	.30Ω 5W 5%
R7	510Ω ½W 5%
R8	1KΩ 2W POTENTIOMETER
R9	1KΩ ½W 5%
R11	1KΩ 5W 5%
CR6	IN 4745 A

P.C BOARD TO BE HUMISEALED

CHASSIS MODIFIED PER AP-70-040

NOTE:

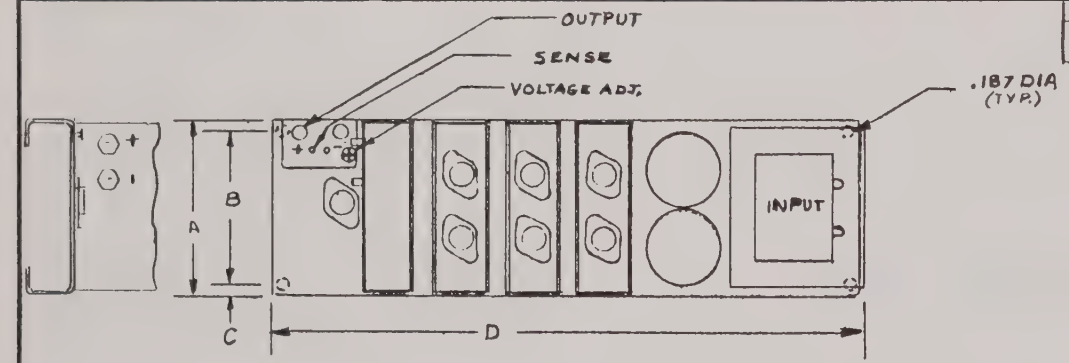
1. VOLTAGE RANGE - 9-15 VDC.
2. CURRENT LIMIT - 5.2 AMPS.

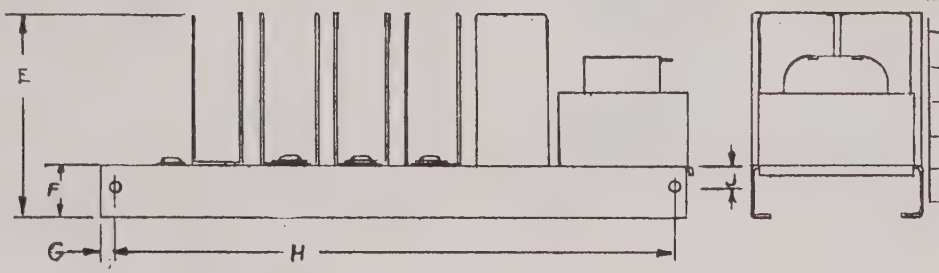
ADTECH POWER, INC.
ANAHEIM, CALIF.

REVISIONS	TITLE	
	S-317 MAKE FROM APS 15-6	
5-10-79		
DRAWN BECK / CHECKED	SCALE N/A	DRAWING NO. AP80-124
APPROVED		

BISHOP GRAPHICS, INC
REORDER NO 20540

REV	DATE	REVISION RECORD	Auth	APP.
B	7-7-78	DELETED DIODE ON HEAT SINK FIN	SW M	





LTR	DIMS
A	4.87
B	4.125
C	.37
D	16.72
E	5.75
F	1.56
G	.36
H	16.00
J	.75

Spec Description

Operating temp range	0° - 50°C
Humidity	0 - 95%
Fungus proof materials and/or coating	
Line voltage	99 to 132 VAC 198 to 264 VAC
Frequeny	47-63HZ
Adjustable voltage range	24.5-28VDC
Current	0 to 10AMPS
Terminal with diode isolation provided for regulated output and unregulated output	

ADTEC

SCALE: ~	APPROVED BY:	DRAWN BY CHH
DATE: 2-17-76		REVISED 10-11-76

POWER SUPPLY
OUTLINE & MOUNTING DIMS — REV B

USEDON
S 319 AIL 28V-9A

DRAWING NUMBER
AP70-042

8½X11 PRINTED ON NO. 1600H CLEARPRINT

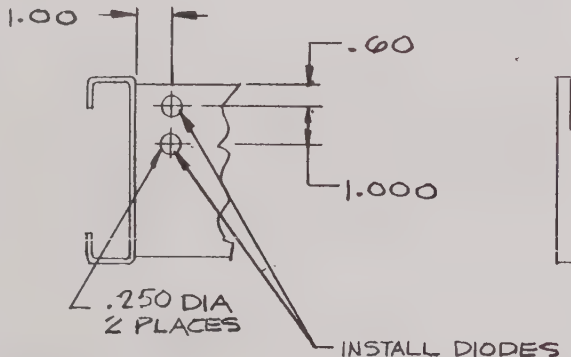
D	12-8	.250 DIM. WAS .225	SM	SM

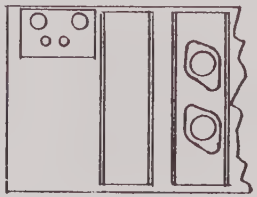
REV	DATE	REVISION RECORD	BY	APPR
A	8-4-78	REVISED NOTETS	JWM	
B	9-3-78	IS .225 WAS .218	JWM	
C	10-21-78	ADDED I.D. FOR DIODE		

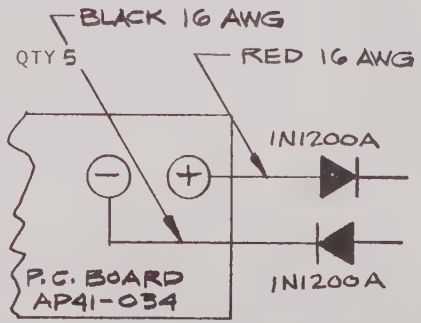
S 319 MAKE FROM APS 28-9

THE S 319 IS THE SAME AS APS 28-9 EXCEPT FOR THE FOLLOWING CHANGES:

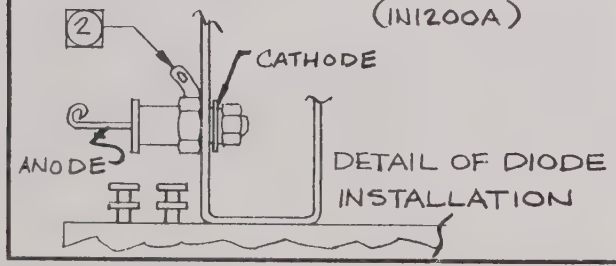
1. ADD HOLES TO HEATSINK AP 40-114-1 AND INSTALL 2 DIODES AS SHOWN IN DRAWING BELOW.
2. DIODES ARE SUPPLIED WITH TERMINALS IN KIT.
3. R12 IS 1.8K OHM WAS 2.2K OHM/ R 16 IS 0.24 OHM QTY. 6 WAS QTY 5
4. HUMISEAL P. C. BOARD







WIRING DIAGRAM



DETAIL OF DIODE INSTALLATION

ADTECH POWER, INC.
1621 SOUTH SINCLAIR ST.
ANAHEIM, CALIFORNIA 92806

REVISIONS	TITLE			
	APS 28-9/S319			
DRAWN MANCARELLA / CHECKED / APPROVED	SCALE ~	DRAWING NO. AP80-188	REV D	

BISHOP GRAPHICS/ACCUPRESS
REORDER NO A-3569

PARTS LIST

P/L NO. 16-001

ADVANCED POWER, INC.
Anaheim, California (S-318)

TITLE: POWER SUPPLY COMMON PARTS

SHEET 1 OF 6

REV. K

BY:	DATE	CHECK	DATE
JES	8/24/74	REC	11/1/74

USED ON MODEL APS 5-3 THRU APS 28-0.8

11-2-72

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
1	REF.		AP 70-010	OUTLINE & MTG. DIM.		
2	REF.		AP 30-032	SCHEMATIC		
3						
4	REF.		AP 16-001	GENERAL ASSY		
5	1		AP 40-099	CHASSIS		
6	1		AP 4-024	P.C. BOARD		
7	1	IC1		INTEGRATED CIRCUIT 35V 723C REGULATOR	SILICON GEN. OR EQUIV	H
8	1	C2		CAP. ELECT. (.375Ø x .750) 47-50 μF 50V RADIAL LEADS		G
9	1	C5		CAPACITOR, CER. DISC 220pf, 25V		
10						K
11	2	CR1,2		DIODE, 3 AMP, @ 75°C. 100V	IRC OR EQUIV.	B
12	1	R6		RESISTOR, C.C. 1K, ½W, 5%		
13	1	R7		" 680Ω, ½W, 5%		E
14	1	R8	115R501A	RESISTOR, VARIABLE, W.W. 500Ω, 2W	CTS	
15	1	R9		RESISTOR, C.C. 2K, ½W, 5%		
16	1	R10	115R502A	RESISTOR, VARIABLE, W.W. 5K, 2W	CTS	
17	2		1300B	SOLID TURRET TERM.	USECO	
18	2	XQ1	A2095	FUNNEL FLG. EYELET	STIMPSON	
19	2	CR3 CR8	10D1 IN4002	DIODE 1AMP, 100V.	IRC OR EQUIV.	J
20	1	CR5	IN914 IN4148	DIODE, SILICONE 10mA, 75V.	MOTOROLA OR EQUIV.	J

PARTS LIST

P/L NO. 16-001

ADVANCED POWER, INC.
Anaheim, California (S-318)

TITLE: POWER SUPPLY COMMON PARTS

SHEET 1A OF 6

REV. K

BY:	DATE	CHECK	DATE

11-2-78

USED ON MODEL APS 5-3 THRU APS 28-0.8

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
21						
22	1		T-231	#6 SHAKEPROOF LOCKING TERMINAL FIG 1	WALDOM	C
23	1	XQ1		MICA INSULATOR TO-3 TRANSISTOR		
24	5			#6 WASHER INT. TEETH		J
25	5			#6-32 x 1/2 LG. PAN HEAD CROSS-RECESSED SCREW		C
26	1			#6-32 NUT		J
27	1		1246-10	6-32 x 5/16 STAND OFF	CAMBION	C
28	1	XQ1	RC-T03862-1A	TRANSISTOR MTG. PAD	ROBISON	B
29	2	XQ1	1246-9	#6-32 x 1/8 STANDOFF	CAMBION	B
30	1		*6-32	SHEET METAL "J" NUT	TINNERMAN	J
31						
32	A/R	XQ1	TYPE 120	HEATSINK COMPOUND	WAKEFIELD	B
33	1			JUMPER + OUT TO C5		G
34						
35						
36						
37						
38						
39						
40						

PARTS LIST

P/L NO. 16-001-2

ADVANCED POWER, INC.
Anaheim, California (S-318)

USED ON MODEL APS 24-1

TITLE: PARTS REQ'D. FOR 24 VOLT 1AMP P.S.

SHEET 5 OF 6

REV. G 10-21-79

BY:	DATE	CHECK	DATE
JFS	9/24/79		

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
1	1	T1	AP 92-011	TRANSFORMER		
2	1	C1	TCW162H050 -N2B3P	CAP., ELECT. (1.00x2.00) 2200 uf 50V	MALLORY	G
3						B
4	1	C3	MTA221N035 -EIAP	CAP., ELECT. (.500x1.000) 220 uf, 35V.	MALLORY	
5	2	R1A R1B	BWH 2	RESISTOR, W.W. 1.2 Ω, 2W, 5%		
6	1	R2		RESISTOR, C.C. 2,000 Ω, 1/2 W, 5%		B
7	1	R3		RESISTOR, C.C. 620 Ω 1/2 W, 5%		D
8	1	R4		82 Ω, " "		
9	1	R5		" 6,800 Ω, " "		A
10	1	R11	BWH 2	RESISTOR, W.W. 2,400 Ω, 2W, 5%		B
11	1	R12	BWH 2	" 820 Ω, " "		
12	1	R13		RESISTOR, C.C. 510 Ω, 1/2 W, 5%		
13	1	CR6	1N4733A	DIODE, ZENER 8.2 V. ± 5%		
14	1	Q1	PMD12K60	TRANSISTOR, NPN		E
15	1	C8		CAPACITOR, CER, DISC .01 uf, 600V		F
16						
17						
18			NOTE:			
19			SEE SHEET 1 FOR ADDITIONAL PARTS			
20						

PARTS LIST

P/L NO. 16-003

ADVANCED POWER, INC.
Anaheim, California (S-317)

USED ON MODEL APS 5-10 THRU APS 28-4

TITLE: POWER SUPPLY COMMON PARTS

SHEET 1 OF 9

REV. A

BY:	DATE	CHECK	DATE
JES	8/24/74	REC	11/1/74

M-378

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
1	REF.		AP 70-013	OUTLINE & MTG. DIMS.		
2	REF.		AP 30-032	SCHEMATIC		
3	REF.		WL 16-003	WIRE LIST		
4	REF.		AP 16-003	GENERAL ASSY.		
5	1		AP 40-103	CHASSIS (SEE AP80-112 MODIFIED CHASSIS FOR SG06)		H
6	1		A.P 41-025	P.C. BOARD		
7	1	IC1	723C	INTEGRATED CIRCUIT 35V REGULATOR	SILICON GEN OR EQUIV	K
8	2	XC1	FV 1614-5	TERM LUG (BLUE)	TOR	D
9	1	C5		CAPACITOR, CER. DISC 220pf, 25V.		
10	1	C4		CAPACITOR CER DISC .01uf 25V, 50V, 100V		P.
11	1	CR1 CR2	R711A OR PMR31K100	DIODES (2) TO-3 CASE	VARO OR LAMDA	L
12	1	R6A		RESISTOR, C.C. 1K, 1/2W, 5%		B
13	1	R7		" 680Ω, " "		E
14	1	R8	115R501A	RESISTOR, VARIABLE, W.W. 500Ω, 2W, 10%	CTS	
15	1	R9		RESISTOR, C.C. 2K, 1/2W, 5%		
16	1	R10	115R502A	RESISTOR, VARIABLE, W.W. 5K, 2W	CTS	
17	4	P.C.B.	1300B	SOLID TURRET TERM.	USECO	
18	6	XQ1-A,B CR1,2	A2085	(SEE NOTE ON SHT 9 ITEM 1) FUNNEL FLG. EYELET	STIMPSON	N
19	1	CR3	10D1 OR IN4002	DIODE 1 AMP, 100 V.	IRC OR EQUIV.	
20	1	CR5	IN914 IN4148	DIODE, SILICONE 10 mA, 75 V.	MOTOROLA OR EQUIV.	L

PARTS LIST

P/L NO. 16-003

ADVANCED POWER, INC.
Anaheim, California (S-317)

USED ON MODEL (F) APS 5-10 THRU 28-4

TITLE: POWER SUPPLY COMMON PARTS

SHEET 1A OF 9

REV. P

BY:	DATE	CHECK	DATE

11-5-78

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
21	1		T231	#6 SHAKEPROOF LOCKING TERMINAL FIG 1	WALDOM	D
22	1	XC1	CESC	CAPACITOR CLAMP 3 FOOTED, 2" DIA.	CALLINS	C
23	4	XT1	C8031-832	SHEET METAL "J" NUT #8-32	TINNERMAN	C
24	1		C8019-632	SHEET METAL "J" NUT #6-32	TINNERMAN	D
25	2	R14 R15	PW-5	RESISTOR, W.W. (SEE SHT 9) 0.1Ω, 5W, 5%	TRW	E
26	3	XQ1-A,B CR1,2	RC-T03062-1A	TRANSISTOR MTG. PAD	ROBISON	C
27	6	XQ1-A,B CR1,2	1246-9	#6-32 x 1/8" STANDOFF	CAMBION	C
28	1	R3		RESISTOR, C.C. 820Ω, 1/2 W, 5%		C
29				JUMPER "D" TO "D" (22 AWG SLEEVE BUSS WIRE)		L
30	1	CR8		DIODE 3 AMP, 100V, @ 75°C.		C
31	4	XT1		#8-32 x 1/2 LG. PAN HEAD CROSS RECESSED SCREW		C
32	4	XT1		#8 INTERNAL STAR LOCK WASHER		C
33	7	XQ1-A,B, XCR1,2, XC1		#6-32 x 1/2 LG. PAN HEAD CROSS RECESSED SCREW		D
34	7	"		#6 INTERNAL STAR LOCK WASHER		C
35	A/R	XQ1-A,B XCR1,2	TYPE 120	HEATSINK COMPOUND	WAKEFIELD	C
36	3	XQ1-A,B XCR1,2		MICA INSULATOR TO-3 TRANSISTOR		C
37	1	5 1/2" LG	C1+	#14 AWG STRANDED WIRE, PVC, RED		C
38	1	7" LG	C1-	#14 AWG STRANDED WIRE, PVC, BLACK		C
39	3		BSP5-3	RIVET	CHERRY	D
40	3			#6 FLAT WASHER .160/.164 I.D.		D

PARTS LIST

P/L NO. 16-003-3

ADVANCED POWER, INC.
Anaheim, California (S-317)

USED ON MODEL APS 15-6

TITLE: PARTS REQ'D. FOR 15VOLT, 6 AMP P.S.

SHEET 4 OF 9

REV. J 11-3-78

BY:	DATE	CHECK	DATE

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
1	1	T1	AP 92-020	TRANSFORMER		
2	1	C1	CGS243U030 -V4C3PL	CAP, ELECT. (2.00 x 4.12) 24,000 uf, 30V.	MALLORY	F
3	1	C2		" (.437 x .750) 220 uf, 35V., RADIAL LEADS		
4	1	C3		" (.562 x 1.12) 470 uf, 25V., RADIAL LEADS		
5	1	R1	RS-5	RESISTOR, W.W. 0.1Ω, 5W, 5%	DALE	B
6	1	R2		RESISTOR, C.C. 1,000Ω, ½W, 5%		
7						B
8	1	R4		RESISTOR, C.C 75Ω, ½W, 5%		
9	1	R5		" 4,700Ω, " "		A
10	1	R11	RS5	RESISTOR, W.W. 500Ω, 5W, 5%	DALE	
11	1	R12	BWH2	" 220Ω, 2W, "		
12	1	R13		RESISTOR, C.C. 510Ω, ½W, 5%		
13	1	CR6	IN4738A	DIODE, ZENER 8.2V ± 5%		
14	1	C8		CAPACITOR CER DISC 0.1uf 100V		J
15	2	Q1A Q1B	PMD10K60	TRANSISTOR, NPN		H
16						
17						
18						
19						
20						

PARTS LIST

P/L NO. 16-009

ADVANCED POWER, INC.
Anaheim, California (S-319)

USED ON MODEL APS 5-25 THRU 28-9

TITLE: POWER SUPPLY COMMON PARTS

SHEET 1 OF 10

REV. E

BY:	DATE	CHECK	DATE
PB	3-24-75		

2-8-79

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
1	REF.	A	AP70-024	OUTLINE & MTG. DIM.		
2	REF.	C	AP30-039	SCHEMATIC		
3	REF.	D	AP16-008	GENERAL ASSEMBLY		
4	REF	B	AP30-037	SCHEMATIC ASSEMBLY (OVP)		
5	REF.	ND	AP20-032	P.C. BOARD ASSEM.		B
6	1	D	AP40-113	CHASSIS		
7	1	D	AP41-034	P.C. BOARD, FAB & DRILL SEE P/L 17-034		B
8						B
9	1	IC1	723C	INTEGRATED CIRCUIT 35 V REGULATOR	SILICON GEN.	
10	6		F033	#6 x 1/4 SCREW, SELF TAP	WALDOM	
11	A/R		TYPE 120	HEATSINK COMPOUND	WAKEFIELD	
12	7		60-11-5442-1664	BLUE INSULATOR (TO 3 CASE)	CHOMERIC	E
13	1	CR8	R 712 E	DIODE	VARO	
14	1	Q4	2N2484	TRANSISTOR NPN		
15	1	CR2		DIODE, 3AMP-100V	IR OR EQUIV.	C
16	1	CR6	IN914	DIODE, 10mA, 75 V	MOTOROLA OR EQUIV.	
17	1	CR7		DIODE 1A, 100V	IR OR EQUIV	
18	2	C2&3		CAPACITOR, CER. DISC .01 µf 200V		
19	1	C6		CAPACITOR, CER. DISC 220pf. 25V		
20	1	C8		CAPACITOR, CER. DISC .02 µf, 100V		

PARTS LIST

P/L NO. 16-009

ADVANCED POWER, INC.
Anaheim, California (S-319)

USED ON MODEL APS 5-25 THRU 28-9

TITLE: POWER SUPPLY COMMON PARTS

SHEET 1A OF 10

REV. D

BY:	DATE	CHECK	DATE
DB	3-24-75	[illegible]	[illegible]

PLH 1-6-77

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
21						C
22	2	R2&19		RESISTOR, 1.2K Ω ½W 1%		B
23						B
24	3	R8 VO&14		RESISTOR, 100Ω ½W 5%		
25	1	R13		RESISTOR, 3KΩ ½W 5%		
26	2	R17&18		RESISTOR, 27Ω ½W 5%		
27	2		1781-2	CLAMP, CAP. 3 FOOTED 2" DIA.	STONE CITY	
28	2		C8019-632	SHEET METAL "J" NUT #6-32	TINNERMAN	
29	3		BSP5-3	RIVET	CHERRY	
30	16			6-32 X 9/16 LG PAN HD, CROSS RECESSED SCREW WITH INT. TOOTH LOCK WASHER		
31						
32	8			10-32 NUT, HEX		
33	3			#10 INT. TOOTH WASHER		
34	1		5432	#10 SHAKEPROOF LOCKING TERMINAL	SEASTROM	
35	6		LB-5	NYLON SNAP PLUG	RICHCO	
36						B
37						B
38						B
39	7		RC-T03062-1A	TRANSISTOR MTG. PAD	ROBISON	
40	1		TY-232M	TY-RAP	T&B	

PARTS LIST

P/L NO. 16-009

ADVANCED POWER, INC.
Anaheim, California (S-319)

TITLE: POWER SUPPLY COMMON PARTS

SHEET 1B OF 10

REV. D

BY:	DATE	CHECK	DATE
DB	4-2-75		

JWM 3-16-78

USED ON MODEL APS 5-25 THRU 28-9

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
41	3		AP40-116-1	HEATSINK - USED ON ALL MODELS EXCEPT APS 13.8-20		A
42	1		AP40-114-1	HEATSINK - USED ON ALL MODELS EXCEPT APS 13.8-20		A
43	3		AP40-116-2	HEATSINK - USED ON APS 13.8-20 ONLY		A
44	1		AP40-114-2	HEATSINK - USED ON APS 13.8-20 ONLY		A
45	2		SJ 5112	BUMPON (BLUE)	3M	A
46	1	R22		RESISTOR, 1.0K Ω ½W 5%		A
47		J1	INSTALL JUMPER 14 AWG			D
8						
9						
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
0						

PARTS LIST

P/L NO. 16-009-8

ADVANCED POWER, INC.
Anaheim, California (S-319)

USED ON MODEL APS 28-9

TITLE: PARTS REQUIRED FOR 28 VOLT 9AMP POWER SUPPLY

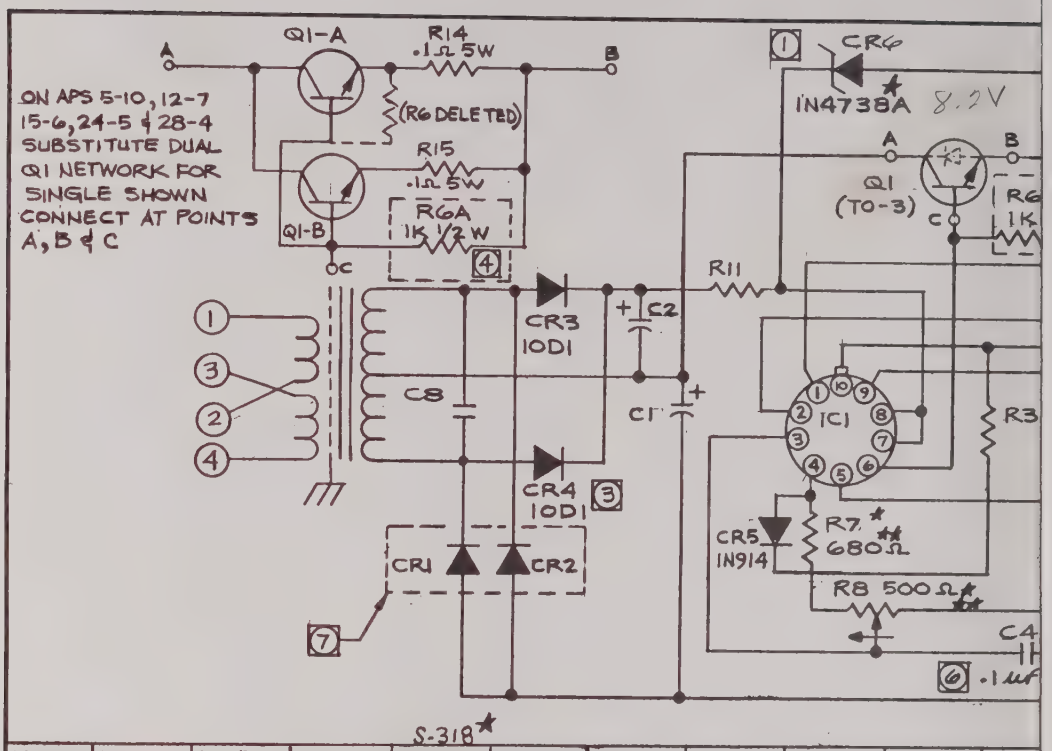
SHEET 9 OF 10

REV. E

BY:	DATE	CHECK	DATE
BB	3-25-78	DLH	3-25-78

REV. 1-3-78

ITEM	QTY/ ASSY	REF. DES.	PART NO.	DESCRIPTION	VENDOR	REV.
1	1	T1	AP92-057	TRANSFORMER	API	
2	1	C1		CAPACITOR, ELEC. (1X2) 75uf 100V		B
3	2	C4&5		CAPACITOR, ELEC (2X4.12) 13,000 uf, 50V.		
4	2	C7 A&B		CAPACITOR, ELEC. (RADIAL) 330 uf, 35V.		
5	3	Q1,2 & 3	2N3772	TRANSISTOR (SELECT 3 OR 4)		A
6	1	Q5	PMD 12K60	TRANSISTOR (2N6055)	POWER MONOLITHICS INC	B
7	2	R1 A&B		RESISTOR, 8.2K Ω ½W 5%		
8	1	R3		RESISTOR, 620 Ω ½W 5%		
9	3	R5, 6&7		RESISTOR, 5.6 Ω 2W 5%		
10	1	R9		RESISTOR, 0.68 Ω 2W 5%		
11	1	R11		RESISTOR, 1.0K Ω ½W 5%		
12	1	R12		RESISTOR, 2.2K Ω ½W 5%		
13	1	R15		POTENTIOMETER 1.5K Ω 2W		
14	5	R16		RESISTOR, 0.24 Ω 2W 5%		
15						D
16	2	R20 & 21		RESISTOR, 10K Ω ½W 5%		
17	1	CR5	IN 4753A	DIODE, ZENER		
18	1	J2		INSTALL JUMPER J2 (ONLY)		C
19	2	CR3 CR4	R712A OR PMR31K200	DIODE ASSY TO3 CASE	VARO OR LAMBDA	E
20		CR9		JUMPER		D
21	1	C9		CAPACITOR CER DISC .01uF 600V		E



MODEL	APS 5-3	APS 12-1.6	APS-15-1.5	APS 24-1	APS 28-0.8	APS 5-6	APS 12-4	APS 15-3	APS-24-2.2	APS 28
Q1	PMD10K40	PMD12K40	PMD12K40	PMD12K60	PMD12K60	PMD10K40	PMD10K40	PMD10K40	PMD10K60	PMD10
T1	AP92-008	AP92-010	AP92-009	AP92-011	AP92-012	AP92-013	AP92-014	AP92-015	AP92-016	AP92-
C1	7,500 uf 15V (1x2)	3300 uf 30V (1x2)	3300 uf 35V (1x2)	2200 uf 50V (1x2)	1,600 uf 50V (1x2)	25,000 uf 15V (1.37x4+2)	10,000 uf 30V (1.37x4-12	10,000 uf 30V (1.37x4-12	6,000 uf 50V (1.37x4-12	6,000 50V (1.37
C2	50 uf 50V	50 uf 50V	50 uf 50V	50 uf 50V	50 uf 50V	220 uf 35V	50 uf 50V	50 uf 50V	50 uf 50V	50 uf
C3	470 uf 10V	220 uf 35V	220 uf 35V	220 uf 35V	220 uf 35V	1,000 uf 10V	470 uf 25V	470 uf 25V	330 uf 35V	330 35V
R1	2x0.39Ω 2W	2x0.75Ω 2W	1x1.0Ω 2W 1x.75Ω 2W	2x1.2Ω 2W *	1x.75Ω 2W	1x0.1Ω 5W	2x0.3Ω 5W	1x0.2Ω 5W	1x0.25Ω 5W	1x0.3 5W
R2	330Ω	750Ω	1,000Ω	2,000Ω *	2,400Ω	330Ω	750Ω	1,000Ω	2,000Ω	2,000
R3	820Ω	750Ω	820Ω	820Ω	680Ω	820Ω	820Ω	820Ω	820Ω	820
R4	68Ω	91Ω	91Ω	82Ω	91Ω	68Ω	91Ω	91Ω	82Ω	82
R5	1,200Ω	3,300Ω	3,900Ω	6,800Ω	6,800Ω	910Ω	3,300Ω	4,700Ω	10,000Ω	10,000
R11	100Ω	1,500Ω 2W	1,500Ω 2W	2,400Ω 2W	2,400Ω 2W	100Ω	1,000Ω 2W	1,200Ω 2W	1,500Ω 5W	1,500 5W
R12	2,000Ω	220Ω 2W	220Ω 2W	820Ω 2W	820Ω 2W	2,000Ω	220Ω 2W	220Ω 2W	680Ω 2W	680 2W
C8	.1 uf 100V	.1 uf 100V	.1 uf 100V	.01 uf 600V	.01 uf 600V	.1 uf 100V	.1 uf 100V	.1 uf 100V	.01 uf 600V	.01 600

S-318

* SEE MAKE FROM APS 24-1" DRAWING AP80-123 FOR COMPONENT VALUE CHANGES FOR S-318

(7) APS 5-6 TO APS 28-4 * R711A (TO-3) CASE.
APS 5-3 TO APS 28-0.8 3AMP, 100V DIODES MOUNTED TO P.C. B

(6) APS 5-3 THRU 28-0.8 DELETE C4

(5) CR8: APS 5-3 THRU APS 28-0.8, 1AMP, 100V. APS 5-6 THRU APS 2

(4) ON MODELS APS 5-10 THRU APS 28-4 INSTALL R6 IN THE RGA POS

(3) DELETE CR4 ON ALL 24V & 28V UNITS AND ON 12-7 & 15-6 UNITS

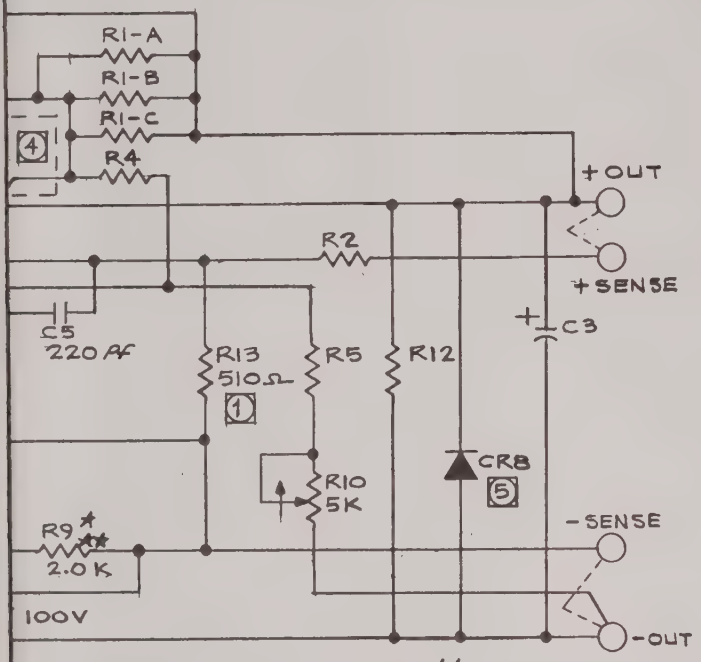
2. ALL RESISTORS ARE 1/2W, I 5%.

(1) ON ALL 5V UNITS DELETE CR6 AND R13

NOTES: UNLESS OTHERWISE SPECIFIED

17X26 PRINTED ON NO. 4000H CLEARPRINT

REV	DATE	REVISION RECORD	BY	APPR
L	1-10-78	REVISED AND REDRAWN FOR PAST REV. SEE HISTORY FILE	JWM	
M	1-15-78	C1 WAS 0.1uf 100V IS .01 uf 600V FOR APS 24-1 & 28-0.8, 24-2.2, 28-2, 24-5, 28-4		
N	12-15-78	APS 28-2 R3 IS 820Ω WAS 560Ω		
P		DELETED .1uf @ 100V FOR CB FROM SCHEMATIC, ADDED TO CHART CB VERSION ONLY		
R	10-18-79	APS 12-1.6, C1 IS 3300uf 30V WAS 2900uf 30V PER ECO 1145 APS 15-1.5, C1 IS 3300uf 35V WAS 2900uf 30V PER ECO 1146		
S	10-22-79	APS 24-1, C1 IS 2200uf 50V WAS 1600uf 50V PER ECO 1147		



S-317★★

-2	APS 5-10	APS 5-12	APS 12-7	APS 15-6	APS 15-8	APS 24-5	APS 28-4					
K60	PMD10K40 (X2)	PMD16K40 (X2)	PMD10K40 (X2)	PMD10K60 (X2)	PMD16K60 (X2)	PMD10K60 (X2)	PMD10K60 (X2)					
017	AP92-018	AP92-018	AP92-019	AP92-020	AP92-020	AP92-021	AP92-022					
uf x4.12	56,000uf 15V(2x4.12)	56,000uf 15V(2.00x4.12	24,000uf 30V(2x4.12	24,000uf 30V(2x4.12	24,000uf 30V(2x4.12)	13,000uf 50V(2x4.12)	13,000uf 50V(2x4.12)					
50V	220uf 35V	220uf 35V	220uf 35V	220uf 35V	220uf 35V	50uf 50V	50uf 50V					
f	2,200uf 10V	2,2000uf 10V	470uf 25V	470uf 25V	470uf 25V	330uf 35V	330uf 35V					
Ω	3x0.2Ω 5W	.1Ω 5W (R1-A,B)	3x0.25Ω 5W	1x0.1Ω 5W★★	.1Ω 5W (R1-A,B)	2x.25Ω 5W	2x0.3Ω 5W					
Ω	330Ω	330Ω	750Ω	1,000Ω	1,000Ω	2,000Ω	2,200Ω					
Ω	820Ω	820Ω	820Ω	820Ω	820Ω	820Ω	820Ω					
	68Ω	68Ω	91Ω	75Ω	91Ω	91Ω	82Ω					
Ω	910Ω	910Ω	3,300Ω	4,700Ω	4,700Ω	5,100Ω	6,800Ω					
Ω	100Ω	100Ω	500Ω 5W	500Ω 5W★★	500Ω 5W	1,200Ω 5W	1,500Ω 5W					
Ω	2,000Ω	2,000Ω	220Ω 2W	220Ω 2W	220Ω 2W	680Ω 2W	680Ω 2W					
f	0.1 uf 100V	0.1 uf 100V	0.1 uf 100V	0.1 uf 100V	0.1 uf 100V	.01uf 600V	.01uf 600V					

S-317★★

SEE "MAKE FROM APS 15-6" DRAWING AP80-124
FOR COMPONENT VALUE CHANGES FOR S-317 ★★

4

OARD

3-4, 3AMP, 100V
TION.

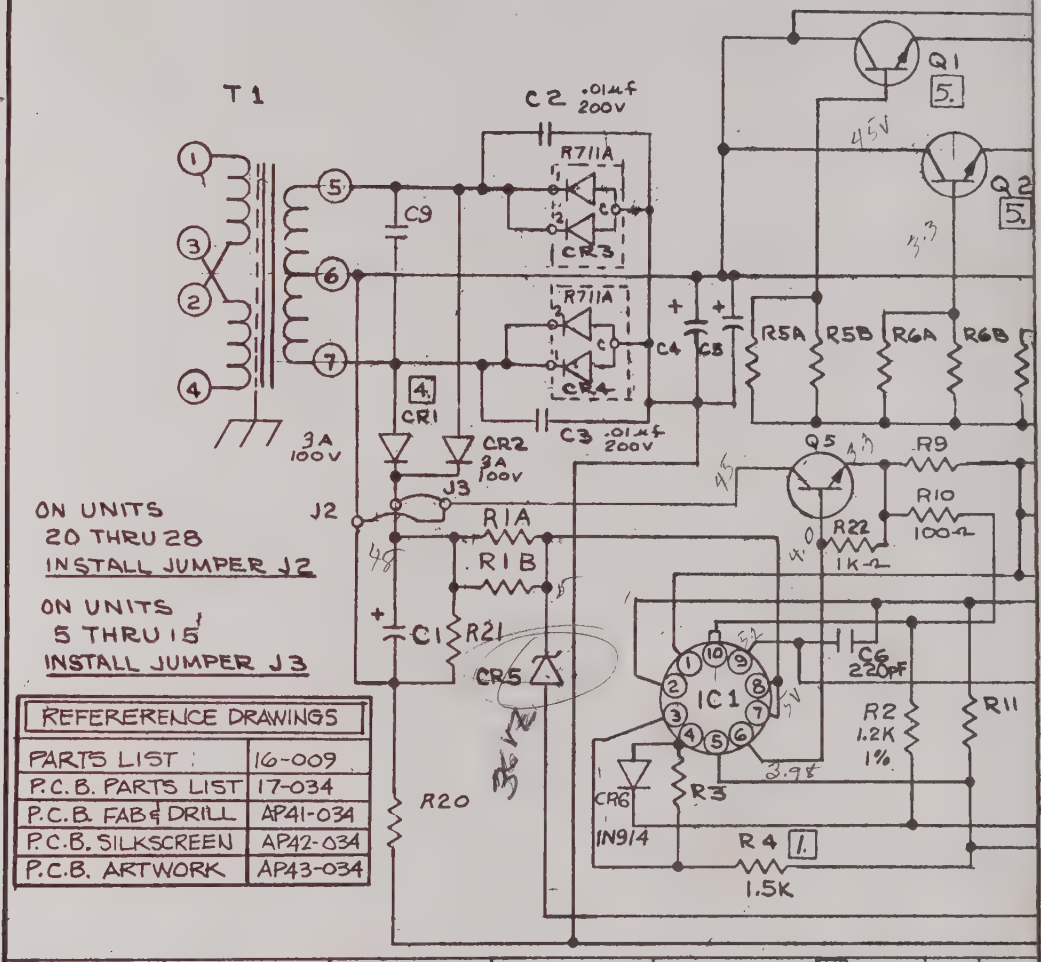
ADTECH POWER, INC. ANAHEIM, CALIF		
SCALE: ~	APPROVED BY:	DRAWN BY MANCARELLA
DATE: 7-30-78		REVISED 10-18-79
SCHEMATIC - APS SERIES POWER SUPPLIES		REV. 5
S-317 & S-318		DRAWING NUMBER AP30-032

CA5: SAME A

Q5: SAME AS

-LZD 36

OSS OR SK3182



ON UNITS 20 THRU 28
INSTALL JUMPER J2

ON UNITS 5 THRU 15
INSTALL JUMPER J3

REFERERENCE DRAWINGS	
PARTS LIST	16-009
P.C.B. PARTS LIST	17-034
P.C.B. FAB & DRILL	AP41-034
P.C.B. SILKSCREEN	AP42-034
P.C.B. ARTWORK	AP43-034

UNIT	T1	C1	C4 & C5	C7A & B	5. Q1 Q2 & Q3	Q5
5-25	AP92-051	7,500µf 15V (1x2)	56,000µf 15V (2x4.12)	2,200µf 10V	2N3771-0 or 1	PMD1
6-22	AP92-052	2,900µf 30V (1x2)	56,000µf 15V (2x4.12)	2,200µf 10V	2N3771-0 or 1	PMD1
12-17	AP92-053	2,900µf 30V (1x2)	24,000µf 30V (2x4.12)	470µf 25V	2N3771-1 or 2	PMD1
13.8-20 6	AP92-050A (SINGLE PRIMARY)	2,900µf 30V (1x2)	24,000µf 30V (2x4.12)	470µf 25V (DELETE C7-B)	2N3771-1 or 2	PMD1
15-15	AP92-054	2,900µf 30V (1x2)	24,000µf 30V (2x4.12)	470µf 25V	2N3771-2 or 3	PMD1
20-11	AP92-055	75µf 100V (1x2)	13,000µf 50V (2x4.12)	330µf 35V	2N3772-1 or 2	PMD1
24-10	AP92-056	75µf 100V (1x2)	13,000µf 50V (2x4.12)	330µf 35V	2N3772-2 or 3	PMD1
28-9	AP92-057	75µf 100V (1x2)	13,000µf 50V (2x4.12)	330µf 35V	2N3772-3 or 4	PMD1
26-12 7	AP92-064	75µf 100V (1x2)	13,000µf 50V (2x4.12)	330µf 35V	2N3772-0 or 1	PMD1

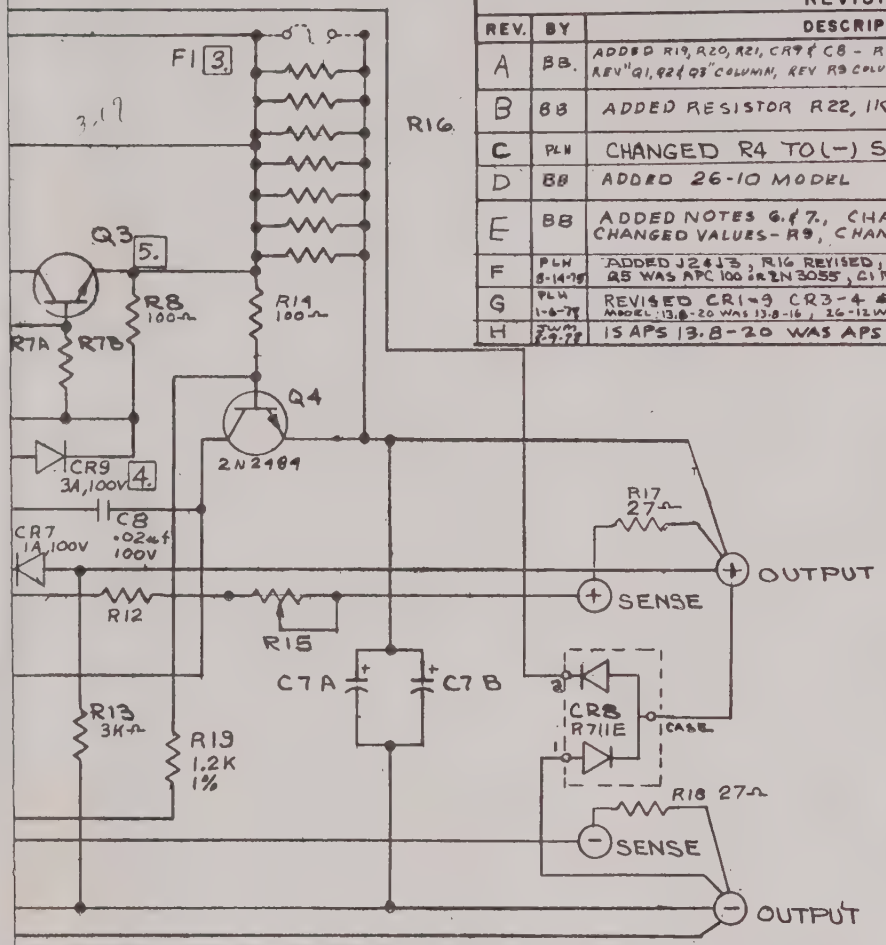
S-319 ★

★ SEE "MAKE FROM APS 28-9" DRAWING AP80-158 FOR COMPONENT VALUE CHANGES FOR S-319★

NOTES:

1. - ON 12 THRU 28 V UNITS, DELETE R4.
2. - ALL RESISTORS - ½ W 5% EXCEPT WHERE NOTED.
3. - F1 TO BE USED TO REPLACE R16 ONLY WHEN SPECIFIED.
4. - ON UNITS 20V THRU 28V REPLACE CR3 WITH JUMPER DELETE CR1.
5. USE SELECTED TRANSISTORS ONLY, BETA MATCHED TO ±10% @ 5AMPS.
6. 13.8-20 IS FORCE COOLED MODEL.
7. 26-12 IS FORCE COOLED MODEL.

NEXT ASSY.	USED ON
APPLICATION	
	APS 26-12
	APS 28-9
	APS 24-10
	APS 20-11
	APS 15-15
	APS 13.8-20
	APS 12-17
	APS 6-22
	APS 5-25



REVISIONS

REV.	BY	DESCRIPTION	APPR.	DATE
A	BB.	ADDED R19, R20, R21, CR9 & C8 - REV "R5, R6 & R7" COLUMN REV "Q1, Q2 & Q3" COLUMN, REV R9 COLUMN, ADDED NOTES 4 & 5.		3-21-75
B	BB	ADDED RESISTOR R22, 11K Ω		4-9-75
C	PLH	CHANGED R4 TO (-) SENSE WAS (-) OUTPUT		4-18-75
D	BB	ADDED 26-10 MODEL		5-15-75
E	BB	ADDED NOTES 6 & 7., CHANGED VALUES Q1, 2 & 3, CHANGED VALUES - R9, CHANGED VALUES & QUAN. - R16		6/9/75
F	PLH 8-14-75	ADDED J2 & J3; R16 REVISED; R2 & R19 WAS 5% Q5 WAS APC 100 OR 2N3055; C1 REVISED SEE EO. 1036		1-1-75
G	PLH 1-6-76	REVISED CR1-9 CR3-4 & C9 MODEL: 13.8-20 WAS 13.8-16; 26-12 WAS 26-10		
H	DWM 2-9-78	15 APS 13.8-20 WAS APS 13.8-16		

UNIT	CR3-4	CR1 4	CR9 4	C9
5-25	R711A	3A 100V	3A 100V	.04UF 100V
6-22	R711A	3A 100V	3A 100V	0.1UF 100V
12-17	R711A	3A 100V	3A 100V	0.1UF 100V
13.8-20	R711A	3A 100V	3A 100V	0.1UF 100V
15-15	R711A	3A 100V	3A 100V	0.1UF 100V
20-11	R711A	DELETE	JUMPER	.01UF 600V
24-10	R712A	DELETE	JUMPER	.01UF 600V
28-9	R712A	DELEE	JUMPER	.01UF 600V
26-10	R712A	DELETE	JUMPER	.01UF 600V

	R1 A&B	R3	R5, R6 & R7	R9	R11	R12	R15	R16	CR5	R20 & 21
2K40	330Ω	1.5KΩ	6-10Ω 2W (A&B)	0.27Ω 2W	2,000Ω	430Ω	1,000Ω	7-0.1Ω 5W	N/R	1.0KΩ
2K40	330Ω	1.5KΩ	6-10Ω 2W (A&B)	0.39Ω 2W	2,000Ω	910Ω	1,000Ω	6-0.1Ω 5W	N/R	2.0KΩ
2K60	2x 2KΩ	620Ω	3-5.6Ω 2W (A ONLY)	0.39Ω 2W	2,000Ω	910Ω	1,000Ω	7-0.16Ω 2W	IN4752A	4.7KΩ
2K60	2000Ω	620Ω	3-5.6Ω 2W (A ONLY)	0.47Ω 2W	2,000Ω	1,600Ω	500Ω	6-0.11Ω 2W	IN4752A	4.7KΩ
2K60	2000Ω	620Ω	3-5.6Ω 2W (A ONLY)	0.39Ω 2W	2,000Ω	1,800Ω	1,000Ω	4-0.20Ω 2W +3-0.22Ω 2W	IN4752A	4.7KΩ
2K60	2X8.2KΩ	620Ω	3-5.6Ω 2W (A ONLY)	0.47Ω 2W	1,000Ω	1,000Ω	1,500Ω	6-0.22Ω 2W	IN4752A	10KΩ
2K60	2X8.2KΩ	620Ω	3-5.6Ω 2W (A ONLY)	0.39Ω 2W	1,000Ω	1,600Ω	1,500Ω	6-0.22Ω 2W	IN4752A	10KΩ
2K60	2X8.2KΩ	620Ω	3-5.6Ω 2W (A ONLY)	0.68Ω 2W	1,000Ω	2,200Ω ★	1,500Ω	5-0.24Ω 2W ★	IN4753A	10KΩ S-319 ★
2K60	2X8.2KΩ	620Ω	3-5.6Ω 2W (A ONLY)	0.39Ω 2W	1,000Ω	1,800Ω	1,500Ω	7-0.22Ω 2W	IN4752A	10KΩ

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES

FRAC. ±1/32 DEC. .XX ±.02 .XXX ±.010 ANGLES ±1/2°

[redacted]: MODEL 5V-25A THRU 28-9

FINISH: NONE

NEXT ASSY QTY. REQ'D | FINAL ASSY.

SIGNATURES	DATES
DWN. PLH & BB	3-10-75
CHK. [illegible]	3-10-75
DSGN.	
ENGR.	
APPR. [illegible]	3/10/75

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ALL PATENT OR OTHER PROPRIETARY RIGHTS PERTAINING TO THE ITEMS SOLD HEREUNDER SHALL REMAIN THE SOLE PROPERTY OF ADTECH POWER, INC. EXCEPT THAT THE PURCHASER SHALL HAVE THE RIGHT TO USE SUCH ITEMS FOR THEIR INTENDED PURPOSE.

DO NOT SCALE DWG.

ADTECH POWER, INC.
Anaheim, California

TITLE

SCHEMATIC APS (S-319) (BLUE MAX)
SERIES POWER SUPPLY

CODE IDENT	SIZE	DWG. NO.	REV.
	C	AP30-039	H

SCALE: ~ WEIGHT: ~ SHEET 1 OF 1

B-21/B-22

8-714-634-9211

APPENDIX C

LIST OF MANUFACTURERS

Adtech Power Inc.
1621 South Sinclair St.
Anaheim, California 92806
Tel. 714-634-9211

AIL
Walt Whitman Road
Melville, New York 11747
Tel. 516-595-4821
TWX 510-227-6073
FAX 516-595-4368

All Metal Screw Products Co., Inc.
821 Stewart Ave.
Garden City, New York 11530
Tel. 516-222-1200
TWX 510-222-8132

Allied Control Gould Inc.
100 Relay Road
Plantsville, Conn. 06479
Tel. 203-621-6771
TWX 710-473-0079

Amp. Inc.
P.O. Box 3608
Harrisburg, Pa. 17105
Tel. 717-564-0100
TWX 510-657-4110

Amphenol
33 E. Franklin St.
Danbury, Conn. 06810
Tel. 203-743-9272
TWX 710-456-0281

Amprobe Instrument
630 Merrick Rd.
Lynbrook, N.Y, 11563
Tel. 516-LY3-5600

Andrew Corp.
10500 W. 153rd St.
Orland Park, Ill. 60462
Tel. 312-349-3300
TWX 25-3897
910-651-3340

APM-Hexseal
44 Honeck St.
Englewood, N.J. 07631
Tel. 201-569-5700
Telex 13-3403

Augat Interconnection
Products Div.
33 Perry Ave.
Box 779
Attleboro, Mass. 02703
Tel. 617-222-2202
TWX 710-391-0644
FSC No. 91506

Belden Corp.
Box 1327
Richmond, Ind. 47374
Tel. 317-966-6661

Bendix Electrical
Components Division
Sidney, N.Y. 13838
Tel. 607-563-5325
TWX 932-456 or 510-261-7550
FSC No. 77820

Brooks Mfg. Co.
Box 17602
Philadelphia, Pa. 19135
Tel. 215-425-3395

Bourns, Inc.
Trimpot Products Div.
1200 Columbia Ave.
Riverside, Ca. 92507
Tel. 714-781-5311
TWX 910-332-1252

Burndy Corporation
Richards Ave.
Norwalk, Conn. 06852
Tel. 203-838-4444
TWX 710-468-2546

Bussmann Manufacturing
Div. McGraw Edison Co.
P.O. Box 14460
St. Louis, Mo. 63178
Tel. 312-739-9600
Telex 44-841

Cinch
TRW/Cinch Connectors
1501 Morse Ave.
Elk Grove Village, Ill. 60007
Tel. 312-439-8800
TWX 910-222-1796

Cohu, Inc.
Box 623
San Diego, Calif. 92112
Tel. 714-277-6700
TWX 910-335-1244

Cutler-Hammer Inc.
4201 N. 27th St.
Milwaukee, Wisc. 53216
Tel. 414-442-7800
TWX 910-262-3089

Devcon Corp.
59 Endicott St.
Danvers, Mass. 01923
Tel. 617-777-1100

Dialco
Dialight Corporation
203 Harrison Place
Brooklyn, N.Y. 11237
Tel. 212-497-7600

Dow Corning Corp.
Saginaw Road
Midland, Mich. 48640
Tel. 517-496-4000

Dwyer Instruments Inc.
P.O. Box 373-T
Michigan City, Ind.
Tel. 219-872-9141

ECC
Electronic Chemical Corp.
813 Communipas Ave.
Jersey City, N.J. 07304
Tel. 201-332-2877

Electro-Mech Components Inc.
1826 N. Floradale Ave.
South El Monte, Calif. 91733
Tel. 213-442-7180
FSC No. 07150

Elmwood Sensors, Inc.
1655 Elmwood Ave.
Cranston, R.I. 02907
Tel. 401-781-6500
TWX 710-381-6413

EMC
Electronic Molding Corporation
96 Mill Street
Woonsocket, Rhode Island 02895
Tel. 401-769-3800
TWX 710-387-1350

Essex-Stancor
3501 W. Addison
Chicago, Ill. 60618
Tel. 312-463-7400
TWX 910-221-5466
FSC No. 80089

Etri, Inc.
8002 S. Madison St.
Burr Ridge, Ill. 60521
Tel. 312-325-9380
TWX 910-226-0424
FSC No. 4N833

Fairchild
464 Ellis Street
Mountain View, California 94042
Tel. 415-962-5011
TWX 910-379-6435

Halkey-Roberts Corp.
38 Spring Valley Ave.
Paramus, N.J. 07652
Tel. 201-843-7700

Hewlett-Packard Co.
1501 Page Mill Rd.
Palo Alto, California 94304
Tel. 415-493-1501
TWX 910-373-1267

Hotwatt, Inc.
121 Maple St.
Danvers, Mass. 01923
Tel. 617-777-0070

Howard Industries Div MSL
Box 287
Milford, Ill. 60953
Tel. 815-889-4105
TWX 910-642-2950

Hubbell, Inc.
State and Thomas St.
Bridgeport, Conn. 06602
Tel. 203-333-1181

Hughes Aircraft Company
Electron Dynamics Division
3100 West Lomita Boulevard
Torrance, Ca. 90509
Tel. 213-534-2121
TWX 910-347-6238

Humidial Corp.
465 Mt. Vernon
Colton, Ca. 92324
Tel. 714-825-1793

IMC
570 Main St.
Westbury, N.Y. 11590
Tel. 516-334-7070
TWX 510-222-4469

John Fluke Mfg. Co.
Box 43210
Mountlake Terr, Wash. 98043
Tel. 206-774-2211
Telex 32-0013

Keystone Electronics Corp.
49 Bleeker St.
New York, N.Y. 10012
Tel. 212-475-4600
TWX 710-581-2861
FSC No. 91833

Lambda Electronics
515 Broad Hollow Rd.
Melville, N.Y. 11747
Tel. 516-694-4200
TWX 519-224-6484

Little Fuse Inc.
800 E. Northwest Hwy.
Des Plaines, Ill. 60016
Tel. 312-824-1188

Loctite Corp.
115 N. Mountain Rd.
Newington, Ct. 06111
Tel. 203-278-1280

Mallory Capacitor Co.
3029 E. Washington
Box 372
Indianapolis, Ind. 46201
Tel. 317-856-3731
TWX 810-260-3940

Milton Ross Co.
511 Second St.
Southampton, Pa. 18966
Tel. 215-355-0200

Molex Inc.
2222 Wellington Ct.
Lisle, Ill. 60532
Tel. 312-969-4550

Motorola Semiconductor Prod.
Box 20912
Phoenix, Arizona 85036
Tel. 602-244-6900
TWX 910-951-1334

National Semiconductor Corp.
2900 Semiconductor Drive
Santa Clara, California 95051
Tel. 408-737-5000
TWX 910-339-9240

Nupro Company
4800 East 345th St.
Willoughby, Ohio 44094
Tel. 216-951-7100

Omni Spectra
21 Continental Blvd.
Merrimack, N.H. 03054
Tel. 603-424-4111
TWX 710-366-0674

Panduit Corp.
17301 Ridgeland Ave.
Tiney Park, Ill. 60477
Tel. 312-532-1800
Telex 25-4560

Pomona Electronics Div.
I.T.T.
1500 E. 9th
Pomona, Cal. 91766
Tel. 714-623-3463
TWX 910-581-3822

Potter-Brumfield Div AMF
P.O. Box 322
Princeton, Ind. 47671
Tel. 812-386-1000
TWX 810-350-2343

Precision Gas Products Inc.
683 Mill St.
Rahway, N.J. 07065
Tel. 201-381-7600

Products Comp. Corp.
34 Lorraine Ave.
Mount Vernon, N.Y. 10553
Tel. 914-699-8640

Raytheon Company
Fourth Ave.
Burlington, Mass. 91803
Tel. 617-272-6400
TWX 710-332-7641

RCA
Rt. 202
Somerville, N.J. 08876
Tel. 201-685-6000

RCL Elec.
AMF Inc.
700 South 21st St.
Irvington, N.J. 07111
Tel. 201-374-3311
TWX 710-999-5511
Telex 138163

Schrader Automotive Products Div.
Scoville Mfg. Co.
2000 Richard Jones Rd.
Nashville, Tenn. 37215
Tel. 615-383-3400

Signal Transformer Co.
500 Bayview Ave.
Inwood, N.Y. 11696
Tel. 516-239-7200
FSC No. 08779

Simpson Electric Co.
853 Dundee Ave.
Elgin, Ill. 60120
Tel. 312-697-2260
Telex 72-2422

Tech Systems
401 Watertown Road
Thomaston, Conn. 06787
Tel. 203-283-5801
TWX 710-475-0537
Telex 96-2490

Tekelec
Div. Ballantine Laboratories Inc.
90 Fanny Road
Box 97
Boonton, N.J. 07005
Tel. 201-335-0900
TWX 710-987-8380

Tektronix Inc.
Box 500
Beaverton, Oregon 97077
Tel. 503-644-0161
TWX 910-467-8708
FSC No. 80009

Teledyne Relays
3155 W. El Segundo
Hawthorne, California 90250
Tel. 213-679-2205

Thermalloy, Inc.
W. Valley View
Dallas, Texas 75234
Tel. 214-243-4321
TWX 910-860-5542

Thermo Electric Co., Inc.
109 Fifth Street
Saddle Brook, N.J. 07662
Tel. 201-843-5800
TWX 710-990-5108

3-M Company
3-M Center
St. Paul, Minn. 55101
Tel. 612-733-3350

Tinnerman Eaton Corp.
Engineered Fasteners Division
Tinnerman Plant
8700 Brookpark Road
P.O. Box 6688
Cleveland, Ohio 44101
Tel. 216-523-5705
TWX No. 810-421-8678
Telex No. 98-5255

TRG Div of Alpha Ind.
20 Sylvan Rd.
Woburn Mass. 01801
Tel. 617-935-5150
TWX 710-393-1236
FSC No. 53536

Ulanet Co.
413 Market St.
Newark, N.J. 07105
Tel. 201-589-4876

Unicorp
575T Nassau St.
Orange, N.J. 07050
Tel. 201-674-1700

U.S. Plastics Inc.
P.O. Box 152
Houston, Miss. 38851
Tel. 601-456-3726

Varflex Corp.
614 W. Court St.
Rome, N.Y. 13440
Tel. 315-336-4400
FSC No. 79074

Wakefield Engineering, Inc.
73 Audubon Dr.
Wakefield, Mass. 01880
Tel. 617-245-5900

Waveline Inc.
Box 718
W. Caldwell, N.J. 07006
Tel. 201-226-9100
TWX 710-734-4324
FSC No. 00443